A Second Opinion On Patents - When To Patent - Startup Mechanics

Component-Oriented Software - Small Time Leading Edge Products - Profit Motivation

Midnight Engineering™

Resources And Insight For The Entrepreneurial Engineer

September/October, 1994
Volume 5, Number 5

$4.95
Canada/Foreign $5.95

I TENTS

...n, and How

VTV

Virtual TV Technology

by Warp California, Inc

ENTCON 1995

April 7,8,and 9
1995
Golden, CO

A realtime version of Midnight Engineering
Magazine for Entrepreneurial Engineers

Reader Service Number 99

eXplore the Opportunities

Create Your Own Automated Systems Using Xplor PDCs and Simple BASIC Programs

Xplor Personal **D**igital **C**ontrollers can propel you into the wide open frontier of computerized control and monitoring with minimal effort and cost. No mere novelty, these "mini-sports" pack surprising power and are loaded with extras that make the journey from idea to working reality fun and rewarding.

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• Screw terminal block and project case.
Also available with 11 channel 10-bit A/D converter – Xplor-32ca

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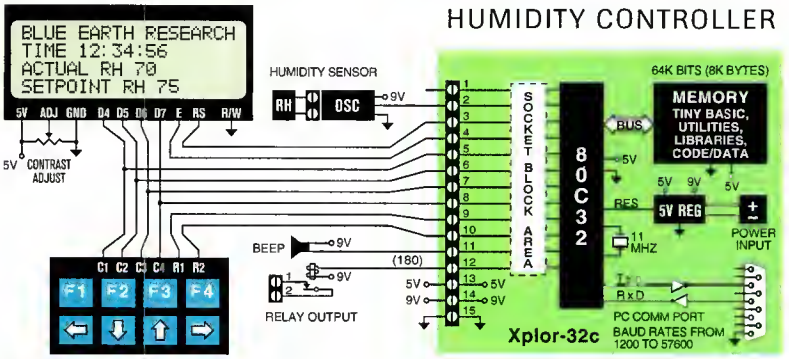
The example below shows how easy it is to wire-up and program the Xplor-32c for a simple on/off controller application. The built-in software gives you the power to write programs like this in just minutes. Your program is stored in nonvolatile memory and will automatically execute when power is applied.

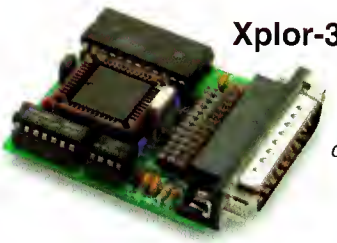


ALL YOU NEED IS A PC and a Terminal Program (Or Xplor Starter Package)

No Other Programming Equipment Required!

```
10  CALL 8132                    (LIBRARY FUNC: Initialize LCD)
20  ONTIME 200                   (Initialize 1 second interrupt)
30  PRINT "BLUE EARTH RESEARCH"; (Display sign-on message)

40  PRINT " \\ ACTUAL RH "; FREQ 0;   (Display actual sensor frequency)
50  PRINT " \\\ SETPOINT RH "; S;     (Display desired setpoint value)

60  CALL 8140                    (LIBRARY FUNC: Get keypad input)
70  IF DBY 27=6 THEN S=S - 1     (Decrement setpoint if down arrow)
80  IF DBY 27=7 THEN S=S + 1     (Increment setpoint if up arrow)

100 IF FREQ 0<S THEN BIT 180=1   (If actual < setpoint then relay on)
110 IF FREQ 0>S THEN BIT 180=0   (If actual > setpoint then relay off)
120 GOTO 40                      (Loop back to repeat program)

200 PRINT " \TIME "; DBY 51; ":"; (This 1 second interrupt routine)
210 PRINT DBY 50; ":"; DBY 49; :IRET ( refreshes LCD with current time. )
```

Xplor PDCs – MORE CHOICES FOR GREATER FLEXIBILITY



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Reader Service Number 105

September/October, 1994
Volume 5, Number 5

Midnight Engineering

Resources and Insight For The Entrepreneurial Engineer

About ME ...

ME is dedicated to those individuals interested in creating, developing, producing, and distributing high technology products. The content is meant to address the individual and small enterprise, their entrepreneurial issues and opportunities, and the technology they use now and will use in the near future. The magazine is designed around the concept of "a half-dozen entrepreneurial engineers sitting around having a beer." Topics will range from embedded systems technical details to software and hardware design. A particular issue might cover biotechnology or nanotechnolygy just as well as everyday personal business such as taxes or time management and productivity. Quite simply, ME reflects the exchange of experience, insight, and concerns of today's entrepreneurial engineer.

This magazine was developed, edited, produced, and published by one person — there is no editorial or production staff involved at any time. The contributors are entrepreneurial engineers and their submissions are not intended to set any literary highwater marks.

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Cover: Conceptual representation of Virtual TV technology running on a set-top box. This home viewer is using his remote control to look around within a complete hemisphere of moving video. Photo designed by Ammon Haggerty, provided courtesy Warp California, Inc.

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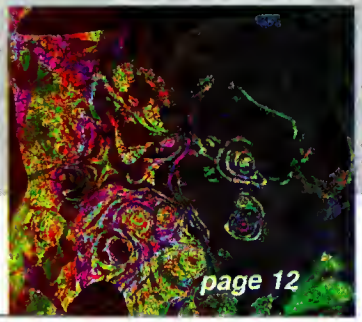

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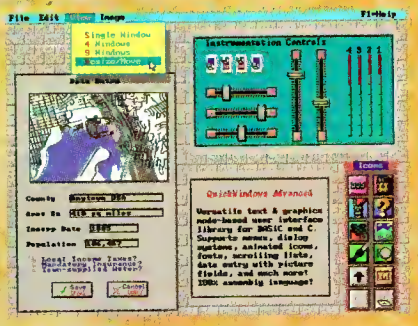

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Letters To ME

ENTCON '94

While in the bookstore a few weeks ago, I noticed the May/June issue of *Midnight Engineering*. As I flipped through the pages, I saw the special report covering ENTCON '94. That reminded me of what a great conference it was.

I first discovered *Midnight Engineering* with the Jan/Feb '94 issue and was completely intrigued with it. So much so, that I attended ENTCON '94. Although I am not an entrepreneur right now, my unstable job as an engineer in the defense industry has encouraged me to pursue becoming one. Your magazine is truly a valuable resource and your conference was not only informative and inspiring but has motivated me to take an old idea of mine down from the shelf, dust it off and try to develop it. I got so much from ENTCON '94 in those few days that it made the fee seem like a real bargain. Your ad is right, ENTCON '94 was "essentially a realtime version of *Midnight Engineering*."

Barry Mathias
Littleton, CO

Delegation Works

Carol and I want to thank you for the terrific review of our book, ***On Your Own***, in the July/Aug issue of ME. We're following your efforts to move all production functions related to ME in-house, including printing, with great interest. Mainly, because much of what you're doing is the exact opposite of what has worked for us. We're making more money, producing more output, and having more fun by delegating more "low value" tasks to outside service venders! I guess the moral of our respective stories is that there are many routes to the summit, and all are valid as long as you get there. Lots of luck in your efforts, and we look forward to how it works out for you. Thanks again!

Harry Helms
High Text Publications
Solana Beach, CA

[You are right, of course, about the different routes. I have talked with many entrepreneurs that **were** *growing a company — through staffing/delegating or contracting out for services — and have since decided that they don't want the result. They have downsized and are producing more, doing it more efficiently, and making more money. There is a right time for everything and right now I don't feel any compulsion to hire or contract out hardly anything.*

On the other hand, I have no intention of doing this one-man show forever. It would not surprise me in the least to find, in a year or ten from now, that I suddenly hire 20 people and go off to do something much more interesting. The excitement right now is the chase to my highest level of relatively sustainable productivity. When I think that I have topped out, much of the interest will wane. There are far more interesting pursuits and challenges than publishing/printing. Of the hundreds of things that I could address, I am currently pondering Very High Speed Underwater Travel (anyone know anything about this?), in keeping with my conclusion that the next 100 years will play out on the ocean floor rather than in outer space as everyone else seems to think. The future is never, I repeat never, where most eyes are looking. —WEG]

Tired of Making My Boss Rich

I've moved, enclosed find my new address. I would like to take the time to let you know that I really enjoy *Midnight Engineering*. Keep up the good work. I am working on starting a small business for myself and have found a host of information that has helped my ideas I have a ways to go but am tired of making my boss rich on my ideas and work.

Robert Kincaid
Citrus Heights, CA

Letters To ME

Downsizing to a Virtual Business

First of all, thank you for sending the 9 back issues of ME that I ordered. I devoured them. Your magazine really "speaks" to entrepreneurs.

I had a real estate development business with 5 employees in NYC for many years and finally got fed up with it. An horrendous real estate market made it easy and necessary to "downsize." And for the past two years I've been running it solo and while I'm working twice as hard, I am about as productive as the five of us were! That realization has just stunned me. So, your articles about your running a one-man publishing business and the many articles about "virtual businesses" really touch an important theme for me.

Frankly, what I think you should do is create a magazine about virtual businesses. Everyone is talking about it, thinking about them, and redirecting their lives towards them. But, no periodical (except *Home Business*, in a cheesy sort of way) addresses them. By the way, there was a fascinating article in *INC Magazine* about a one-man kayak manufacturing and distribution business. Maybe its something your readers would like to see.

Vincent Crisci
New York, NY

Impossible to Put Down

I would like to applaud you and congratulate you on an outstanding project. Not only are the articles stimulating and the concepts/ideas refreshing, but are also done in such a manner that once the magazine is begun, it's impossible to put down until fully read!

I, for one, wish you every success. I am heartened to find that there are still real people in this culture that make a go of it and are successful — regardless of the obstacles that are everywhere.

Thank you for a wonderful window on hope, accomplishment, excitement and fulfillment in an age of great intellectual and cultural darkness.

Michael W. Warwick
Owner, Horizon Technology
Phoenix, AZ

Review of July/August Issue

Although I must, admit I haven't been reading ME closely for the last couple months, I did read the July/August issue with a great deal of attention; specifically the latest installment of the *Boston Operation*, *Extreme Productivity* and the *Edge of Chaos articles*.

I personally wish you the best of luck in your innovative approach to the printing operation, and I believe ME will be a better product for your efforts. As far as validity of your approach, I'm not sure what validity means in this case, I think viability might be a better word. I imagine if you are successful, your approach will be considered valid. I think most of the resistance to taking dramatic or unconventional action stems from the temptations of delegation as you illustrate, or a perception that one needs special training and experience before starting a project. I'm a programmer/analyst by vocation, but taught (and am teaching) myself something of digital circuit design and microprocessors by reading and experimenting and blowing out ICs. Now it's a hobby and I can appreciate the cultural and personal inertia which interfere with just doing something and figuring it out. Given passion and lots of homework, I think almost anything can be accomplished, as you are demonstrating.

The Chaos article had particular resonance to me; I've just left my first job out of school where I worked for about 4 years, and I can personally testify to the stifling effect an over-controlling bureaucracy can have. The company I worked for had, over the last several years, attempted to place (read force) a "science" of software development under the guise of TQM, and at the same time reduced the worker-bees latitude in decision making. I think it was a well

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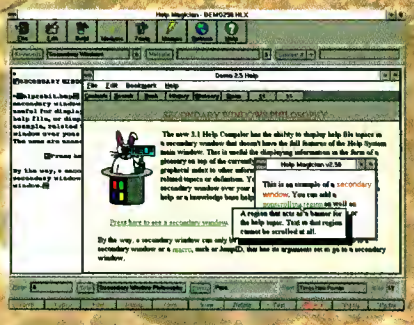

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Time Leakage

Where does this stuff *TIME* go to when it leaks out. You know what I mean — those situations develop where you run out of time. You were sure that you had enough, but when you went to use it, it just wasn't there!

Traditionally, time has been represented by the hourglass incessantly draining its sand from the upper chamber to the lower. I am very suspect of this hourglass metaphor, because it implies that the time goes somewhere that you can control, reclaim, reuse, and reset. The incessant tick-tock of the clock is not a good metaphor for time either, since time is elastic relative to our degree of desperation at the moment.

Since we see some folks running and others strolling, we must conclude that time is malleable — we define time by our goals, commitments, and mental whims. Suddenly, you realize that you're about to be late for a very important date and time seems to evaporate right before your eyes.

In this light, it seems much more appropriate to think of time as a liquid or gas held in leaky vessels. Different kinds of time for different situations.

Right this very moment, I am as up against the wall as any publisher can possibly get. Most of the magazine you are currently reading has already been printed. Pages 9-16 and 65-72 are on the press right now and in three hours when those pages finish, the printing company expects to put the last pages, 1-8 and 73-80, on the press. That means that in two hours they want to "burn" the printing plate that contains this page you are reading. Of course, the page you are reading doesn't exist yet. The film at the printing company has a big blank spot for this page and I have run out of time to fill it.

A more professional editor/publisher would have a stock editorial he could grab off the shelf, but I have always reserved this space for my final, realtime, inspiring words. Well, this is only the second time in five years that I have found myself so very much out of time that I am actually chasing the tail of the magazine through the press. Of course, when I get my own press working, the definition of this particular moment in time will change, because I can simply rewrite the script so that this actor has a little more time to finish the scene. The printing company, however, is more interested in getting onto the next printing job than in letting this actor finish his lines.

Complexity Happens

Bumper sticker mentality, but nevertheless it's true. No matter how hard you try — perhaps because you try so hard — things just get complicated. And, complexity boils the liquidity of time into a gaseous desperation. I don't think we consciously try to get ourselves into these situations. On the other hand, I'll bet that there is some sort of subconscious brinkmanship at work here.

At any rate, I have changed printing companies 3 times in the last 30 days and I have made and remade this issue of ME 4 times. The magazine was first laid out for the original printing company I have used for most of the five years ME has been published. For reasons I won't go into here, I changed to a new printing company with a different press layout and then changed back to the old printing company and then back the new one again. Like a kid jumping from stone to stone while crossing a stream, there is high anxiety with each decision based on the fear that possibly you could end up not finding the next stone and falling into that most-feared publishing maelstrom: *The Missing Issue.* I have been a week or so late with an issue from time to time, but have yet to miss an issue.

There is a week of work involved in tearing down the film laid out for the one printing press and setting up for the other. Each time I thought is was the real thing. Guided by some arbitrary schedule I committed to, I would push real hard to finish the film preparation on time. Each time it is sort of do or die proposition. Exhausted, but done, I delivered what I thought was final film to the new printing company, only to find out that there was a misunderstanding about the page layout and all the pages were in the wrong places. What a tragedy.

No one knows why these things happen, but that's complexity for you. Look for complexity and you will find limitless possibilities for miscommunication. If we do work under a set of assumptions that were miscommunicated, then how do we account for the time spent and the product turned out during the period of time we held those assumptions? I guess we usually call that "wasted time."

I was getting pretty tired of remaking this issue. My own mental and physical resources were running very low and the prospect of another week was incomprehensible. I turned to my last resort: Cheat!

I Take My Chances Every Chance I Get

That's what Mary Chapin Carpenter says in the country song — and I do. Like a chainsaw, I took a pair of scissors and cut the stripped up flats of film and sheet plastic in half, turned them around, moved them apart a little and taped them down on another sheet of plastic in the proper order for the new printing press. The prepress department at the new printing plant was appalled at the mess I gave them to make plates from. They said that ***halation*** (light leakage through many layers of film, plastic, and tape) would blow out the image when the plates were burned. They thought it should be restripped. I'm writing the checks and I say run it. It's running now and I can't find any halation. That doesn't make me right, but it was a desperate move that reclaimed some of that "wasted time."

Some of my color photo separations are still goofy, but **Publication Printers, Inc** in Denver pulled out all the stops for me on this one and I appreciate it.

Bill Yates

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Back Issues ...

Back issues of Midnight Engineering are available at $3 a copy (includes shipping and handling). All back issues are available except for Jan/Feb '90 through Sep/Oct '90 and the Jly/Aug '91 issue. For an index, consult the ad for Tech Pubs Indexes on page 58 in this issue.

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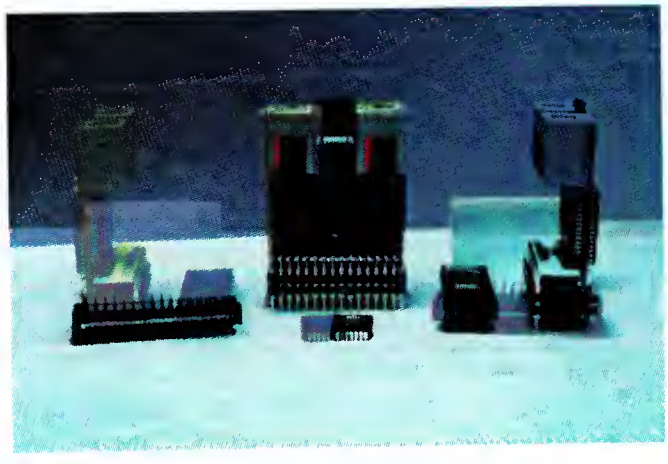

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Letters To ME

meaning response to project failures and client dissatisfaction, but ultimately led to ballooning paperwork, costs and development time as well as excessive documentation/management. Of course, this made the problem worse, further dividing the management from the rank and file and really upsetting the clients.

This was a 700+ person civilian government contract, and when I left, one of the managers told me they were losing 3 or 4 people per day and had been for months. Since most of this could be traced to the terms of the contract and the dynamics of the feds and contractors, I imagine it is symptomatic of government contracting in general. As a taxpayer this kind of situation is really frustrating. I always made extra efforts to deliver quality as inexpensively as possible to my clients, but there are few if any incentives for inexpensive quality (or even quality) in the government contracting business as far as my experience goes. Thanks again for your wonderful magazine.

Greg Menke
Frederick, MD

What Happened to the July/August Issue

As a subscriber to ME, I have been following your *Boston Operation* with great interest. I wish you all the luck with establishing your own printing press. (Hey, don't you need all those nay-sayers in order to rebel — in order to prove them wrong? How much *fun* would it be if everyone you told about it just said "Yeah, that's no big deal."? Ok, Ok, just kidding.)

I am also writing to complain about the typeface/ink/etc. you are using. I don't know if V5 N4 is any worse than its predecessors, or maybe I'm finally getting fed up. The typeface is toooo thin/light. Up through page 17 the type seems dark enough, but starting on page 18 it almost looks as if there wasn't enough ink. The left half of page 22 is too light, but the right half seems to be Ok. Likewise, the left half of page 23 is Ok, but the right half is too light again, up through page 38. Page 39 is noticeably darker and more readable than page 38. Anyway, I very much hope you can get the quality control nailed down soon, it was very hard reading V5 N4.

Douglas Philips
Pittsburgh, PA

[You are quite right about the July/August issue. For the last three issues, I have done some experimenting with color separations, camera work, etc. To be specific, I shot all the film for the last issue using old technology litho film and developer (I'm still learning the hard way for my own reasons). Holding the film up to the light, you could see some silvery-looking sparkly anomalies on the film, but the negative image was all there. At the printing plant in Denver, they pull a blueline proof (exposing a particular kind of paper to intense light) of each page to check for errors. The blueline looked pretty good, so I OKed them to go ahead and make the plates for printing.

When we got on the press, everything went to hell. It ends up that my developing technique was at fault, but did not show up on the blueline. The printing plates are, after all, burned using a different light source and a different technique. Comparing the blueline proof to the printing plates showed a 20 - 30% degradation of all images and text. Well, there I was again, the product of my own overreaching of my own abilities. It didn't matter that no one had ever seen such a discrepancy between the proof and the plate. What mattered was how I was going to handle my problem. Using my 80% solution principle, which I have written about before, I simply told them to run it — I was out of time and out of options.

The following week, Linda Nelson, the regional tech rep from Kodak, traveled 150 miles from Denver to get me up to speed on the very latest in film and developing chemicals. She also showed me how I could reduce my darkroom time by 80%. With any luck, you'll notice exquisite text and lustrous color in this issue. —WEG]

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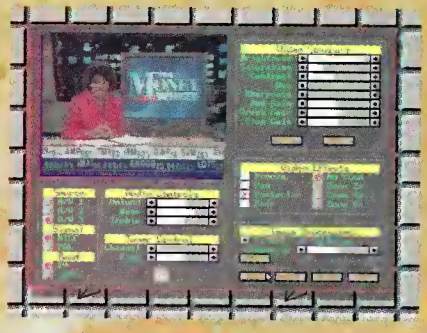

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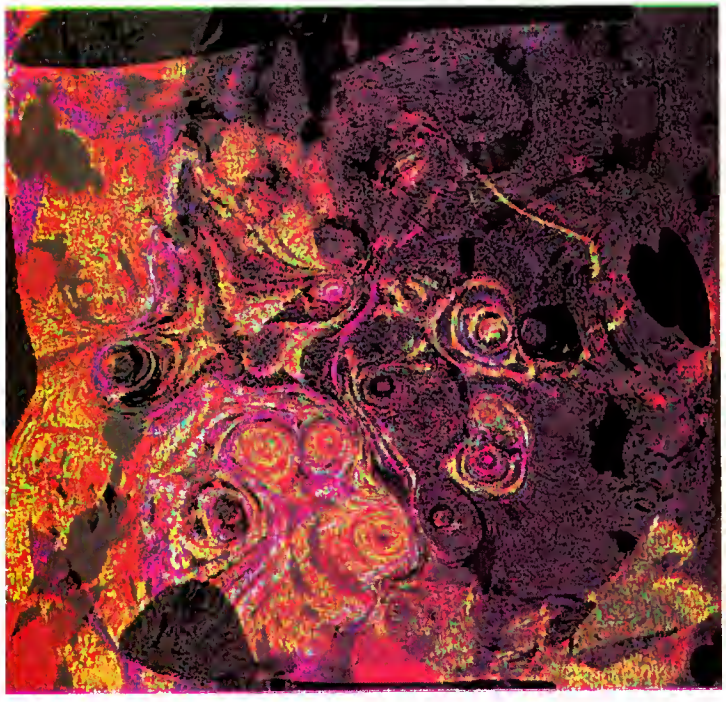


Small Time, Leading Edge Products

by Charles Ostman

Every now and then I make a point of observing what "milestones" of new software products are changing the nature in which various types of applications or problems are "solved"on the PC platform. Considering that this platform represents something in the realm of 80% of worldwide platform marketshare, it is quite likely that this is going to represent the core of mainstream software development for years to come.

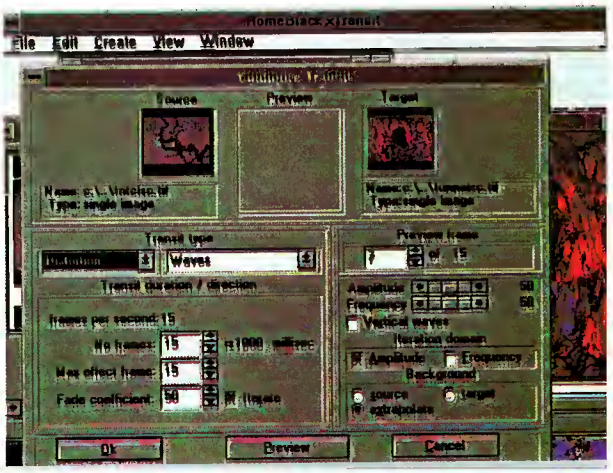
My attitude tends to be one of caution, however, when an endless stream of vendors are constantly thrusting their latest quasi-beta version of some new "breakthrough" product out into the marketplace. In fact, for anyone seriously interested in the ups and downs, not to mention real pitfalls of the software development industry, I very much recommend W. Wayt Gibb's excellent article *Software's Chronic Crisis* article in the September '94 issue of *Scientific American*.

He particularly gained credibility in my eyes when he went into a bit if a diatribe about how it has become an "industry standard" of procedure to release half baked, partially functioning software products, with the intention of allowing the task of debugging sub-beta versions of the software onto the unsuspecting buying public. This is *Scientific American* publishing this, mind you! Well, thank you very much for having verified the obvious. In parallel with this were many other aspects of commercial software product releases and so-called "upgrade" cycles as a marketing ploy. So none of this came as even a suggestion of a surprise to me.

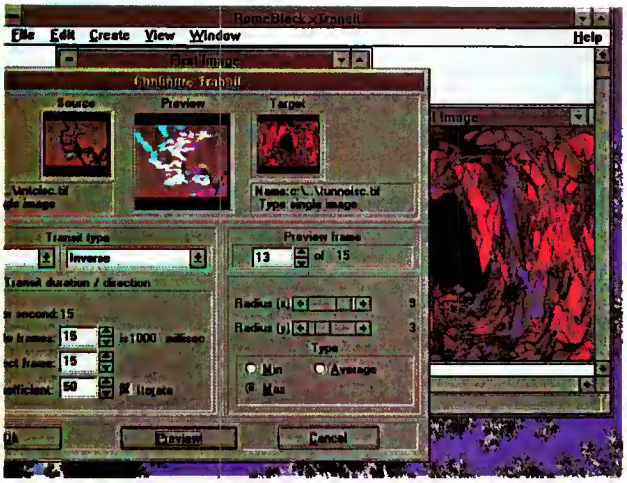
If someone is going to get my attention with a new software product or concept, it is really going to have to be something different, or amazing, or just plain good (what a concept).

It is with this hardened exterior of software "street wisdom" that I tend to take a fairly jaundiced view of far out, lofty sounding product claims and exceptionally fluffy looking promo fanfare. (You wouldn't believe the sheer tonnage of techno-junk mail and demo disks I have to wade through just to see something interesting). In other words, if someone is going to get my attention with a new software product or concept,

XTransit performing a simple morph transition between a pair of fractal bitmap images generated by the author. No morhping control points were specified here for this sequence.



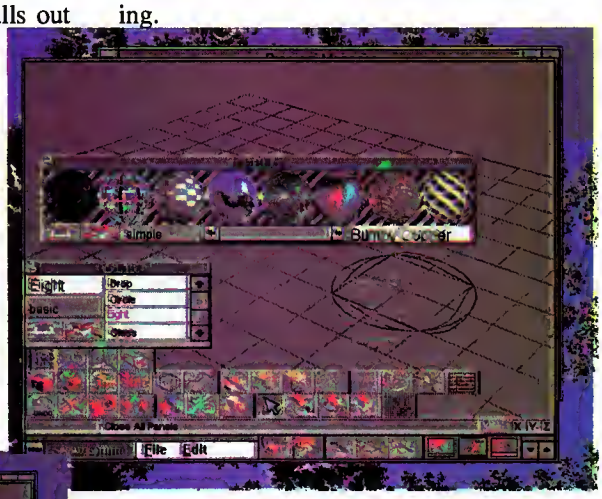
An example of a "transit" setup screen, where the effect type, variables for the selected effect, number of frames for the sequence to be generated, and other relevant details can be defined.



A "severe" amount of mosaic effect function was executed on the first image, the results of which are visible in the preview window. This effect, along with the 25 other effects available, can actually be "skewed" over a series of sequential frames.

from high end printing, to virtual reality, multimedia, and special effects systems are on display to be observed. Any vendor who has even a passing interest in entering into any of these market arenas pulls out all the stops to see and be seen at this show.

Therefore, this is one of those "milestone" events, where I make an effort to dig up the strange and unusual, and often obscure products hiding in a corner somewhere. It is along these lines that three particular applications have gotten my attention, either because of the personal pleasure of experimenting with over the past years, this was not the case for the PC. Recently, though, one very delightful exception to this has appeared, and may perhaps be an indicator of where this software industry is heading.

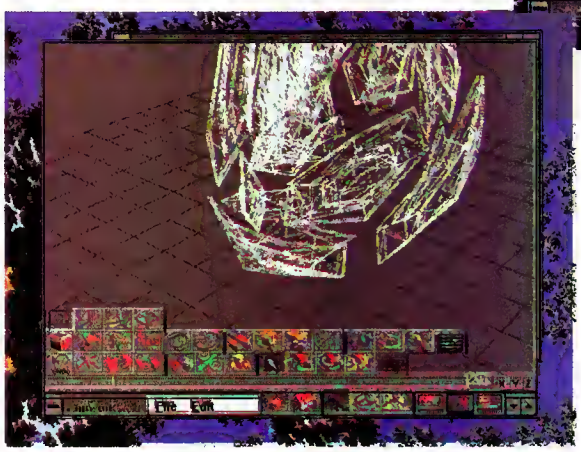


In the main editor screen of TrueSpace. Note the predefined path set macros selectable from the window in the lower left portion of the screen. A basic polygon was created, and then modified to conform to a "figure eight" path object. Also, note the sample procedural texture selector menu.

it is really going to have to be something different, or amazing, or just plain good (what a concept).

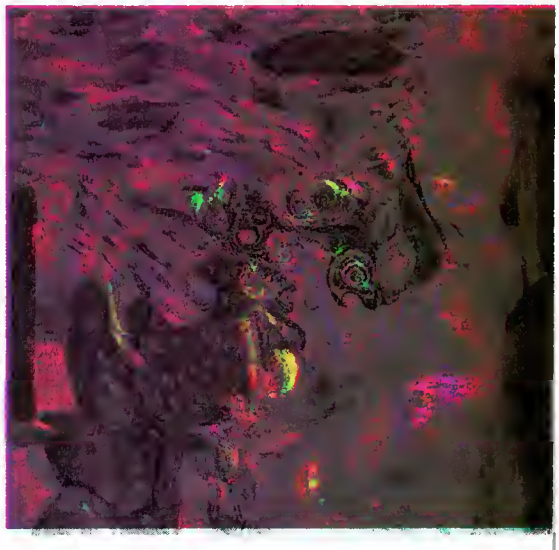
As many of my readers probably know (assuming I have lots of readers, of course), I have a bit of an interest in things like digital image processing, 3D rendering, various "effects" tools, compression technology, and things of this nature. In fact, I was just at SigGraph in Orlando, Florida, with some of my unusual computer imagery on display. This event is considered to be the event of events for persons of these interests. This year, some 40,000+ people attended both the trade show itself, and the various technical lectures and the well famed "Electronic Theater" event.

This is the event where every conceivable vendor,



An example of a complex, procedural mesh object imported directly into the modeler/editor. The importation process was smooth, and fast. This is remarkably different than other applications that the author has used in the past, which were anything but "smooth" when it came to handling "alien" mesh data.

Called xTransit, and coming in a bright orange package somewhat resembling a small box of Tide laundry detergent, this seemingly innocent looking little product carries a lot of punch for its very reasonable (under $100) price tag. Even though it comes with a fairly minimal manual (indeed, this entire package is definitely the "no-frills" approach to software), it's modest appearance is quite misleading.



Another example of an imported, "alien" mesh object (a 3D laser topographical scan of a piece of wood, converted to DXF polygon mesh data). Note the second, perspective viewing window, and also, the mesh "primitive" solids selector for creating new mesh objects for the scene.

the newness of what they do, or their relative cost/performance factors compared to previous competitor's examples.

Traditionally, so called "special effects" image processing software has been expensive, complex, and far from being "quick and easy." Although some interesting examples existed for the Amiga platform, which I had

Essentially, it allows the user to create a variety of distortions to digital imagery, such as ripples, waves, bubble, fisheye effect, and so on. But also, it provides the ability to render a series of image frames as a sequential animation. It is here that the real power of the program begins to show itself. Although several moderately priced programs now offer the famous "morphing" effect, as seen on so many TV commercials, music videos, and so on, xTransit's approach to this is interesting.

The important feature here is the clever way in which quite a variety of effects can be rendered through a series of transitions. Indeed, the variety of special effects animations, (and other applications, such as animated texture and bump map sequences that can be used with other rendering tools) is more than sufficient to keep even the most imaginative digital "artist" pre-occupied for some time.

The user starts by creating a project file, which contains all of the details for the particular feature sets that a given frame set will be modified and rendered with. These project files can be quite elaborate, with one effect set, or "transit" blending into another over a contiguous sequence of frames. Once a frame sequence is rendered, it can be viewed as a "film strip," and the user can modify the sequence by editing or injecting new "members" into the frame sequence. In fact, an elaborate sequence of transits can be linked together to render a surprising array of complex, professional looking animation/effects sequences.

Of course, individual frames can be rendered as "still frame" art, using any of the distortion effects as a one time modification to the image, or the image can be remodified any number of times sequentially. As of this writing, the author has only begun to delve into the variety of possible bizarre effects that can be explored, and experimented with.

As a final note, the program is remarkably bug free. It actually did what the documentation said it would do (what a concept) and inputs and outputs to a very wide range of image and animation sequence format types (including the Microsoft AVI format).

In my world, however, I tend to work mostly in three dimensions when creating some sort of scene art (as in the case with the covers of previous issues of ME). This is because, in most cases, I am not interested in making "pictures" of something, but rather actually creating a virtual environment. These environments contain all of the components of a "virtual world," just as one recognizes the components of the "real world." In this way, I can explore the interaction of theoretical objects, create organic forms that evolve according to some sort of rules set, and so on. The resulting forms can then be textured, illuminated, and "photographed" through the virtual lens of the 3D rendering software. The "photographing" utilizes a process often referred to as raytracing (so named because theoretical rays of light emanating from a vir-

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tual light source interact with the objects in a given scene, and the results are calculated to simulate the way that real rays of light would illuminate actual objects in the real world).

I have rather severe requirements for any 3D rendering tools I use, not just because of the complexity of the objects constructed, but also because of the interactive nature of many of the animation activities within a given event sequence that I will program into a scene. Therefore, I freely admit that I can be a bit harsh when judging a 3D modelling/raytracing/animation tool. I've seen or used just about everything that exists out there—not to mention a number of extremely specialized, experimental versions of these sorts of tools which will probably never become general purpose, consumer products because of their technical features.

...it not only does make nice "art," but also supports enough technical features to actually make it interesting to the serious user.

One such application which I was truly impressed by, however, especially for the relatively low cost (under $500), is the new TrueSpace 3D rendering and animation tool from Caligari. It would be difficult to explain all of the various features of this tool in this article, but for an application designed to run on any garden variety 486 with Windows, this package offers some features usually found on much more pricey software running on SGI Unix workstation platforms.

Some of the features that are of particular interest to me in TrueSpace are things like macro definitions for predefining path data sets, the ability to create and manipulate spline polygon "fields" (this allows for very smooth, curved, and "deformable" feature sets as part of a polygon mesh object construction process), and excellent texture mapping options (including procedural shader routines which allow the user to create very high quality refraction and reflection features). The product has a surprisingly robust mesh importation ability to recognize most of the well known mesh formats including the somewhat obscure, but very useful Videoscape "geo" ascii number table format, because it allows the user to create XYZ space point data sets from procedural routines which can be readily recognized by the target application without a lot of annoying, time consuming mesh file script conversion.

Much of my work consists of building very elaborate mesh files, often by writing C code routines to "construct" the object in question based on some sort of computational event sequence. Often, when some of the rendered results are viewed by the general public, there are the usual questions like "Gee, how did you draw this?" It is difficult, if not often frustrating, to have to try to explain to the uninitiated, that there is no "drawing" of anything, and that many of the elements in the scene (including the colors and forms of the surface textures, as well as the object solids in the scene) are the results of writing code to create the contents of the scene.

Because of this, I place a high emphasis on data importation and manipulation capabilities, and the ability to create macros,

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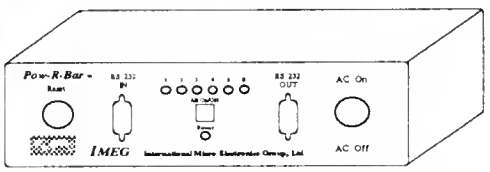

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and other process oriented features. This is not to say that I don't also have an interest in the aesthetic quality of the finished, rendered imagery (which I indeed do). But, many rendering tools seem to be obsessed with user friendly fluffiness, but not much attention to technical details or abilities. This is what makes TrueSpace interesting, in that it not only does make nice "art," but also supports enough technical features to actually make it interesting to the serious user.

There are a few other features worth mentioning here, particularly TrueSpace's specialized texturing tools, such as environment, and transparency maps. The environment maps are procedural texturing attributes which can provide very nice effects, like chrome metallics, for instance, without having to actually perform the extremely time consuming process of true raytracing to provide what looks like a raytraced surface. The transparency maps are just that, regions of transparency which can be part of an imported bit map with "blank" regions, which is a tricky way of rendering a object with apparent "holes" or complex structural features, but mapped onto a fairly simple polygon mesh solid.

And The Winner Is...

And finally, a truly unique and interesting software product: VTV from Warp California software. This product is so ... well ... different, that it will take a bit of an explanation just to describe what it does.

Simply put, this product provides the user the ability to pan around and interactively view a scene from what seems like any angle within a 3D scene region. This is accomplished even though it is in fact a standard broadcast video signal, or computer rendered bitmap image. The effect, when viewed for the first time, can be rather startling, to say the least. Obvious applications immediately come to mind, such as interactive kiosk displays, medical or specialized technical viewing systems, interactive entertainment and educational applications, virtual "galleries," etc.

But the nifty feature here is that a simple converter hardware unit can be attached to any video cable input to render the effect. Even more interestingly, for computer display usage, no specialized hardware is required at all. The demonstration I personally witnessed was on a garden variety 486 with an ordinary VGA display card and monitor. There were no coprocesser devices, special display boards, anything like that at all. And yet, with nothing more elaborate than an ordinary joy stick control, I was able to pan around "inside" of what appeared to be a truly three dimensional region. In one example, I was "flying" around in a pre-rendered 3D Studio scene, and in another, I was looking at what appeared to be an ordinary frame of video, but I was able to pan around from side to side, up and down, almost as if I was actually in the scene. As I said earlier, you have to actually see this to believe it.

As Warp's own literature describes their process, "with VTV, a viewer sees a perspective corrected dewarped region of the wide angle input image." In other words, an input image source is "distorted" with the equivalent process of a virtual fisheye type of lens, thus rendering something of a quasi-spherical interpretation of the image. In the case of actual live

All of the products mentioned above have come from little companies where a handful of very smart, focussed entrepreneurs had a good product idea, got it to the point where it was marketable, and it is now "out there." In the case of RomeBlack, developer of the xTransit special effects software, I was able to communicate directly with Daniel Schwartz, the president and founder whenever the need arose, and he has been most helpful in delving into the technical details of this product, and future developments. Calagari, creator of the TrueSpace renderer, has been around for years, with its product line designed for the Amiga platform (until recently, of course), but has always remained close to its user base. There is always someone alive and breathing on the technical support line when you need them (which is an extremely different attitude than the support response I have personally witnessed from some of those other rendering software companies).

Most interestingly perhaps, is Eric Gullichsen, along with his Warp cofounding partner Susan Wyshynski. They started out on a sailboat floating around in the Sausalito boat harbor, with a good idea, a handful of computers, and lots of midnight oil burning. It has always been the focus of *Midnight Engineering* to shed light on the Midnight Engineers that are out there, actually inventing and developing new and innovative products. Though there has been pessimism expressed by some that such things are no longer possible, I tend to disagree strongly. I point to the above examples to show what is possible.

Graphic Credit:

The graphic in the upper left corner of page 12 and the lower right corner of page 13 were generated by Charles Ostman

These two are examples of 300 frame animated texture sequences generated as a morph sequence. Note the control point locations throughout the image plane. Here the author has combined custom generated 2D fractal and plasma fields, and pre-rendered 3D raytraced imagery, to create "unusual" morphing animated texture maps, which will be used in another 3D rendering.

Resources

Warp California: 415-331-6203, Sausalito, CA

RomeBlack: 212-727-9735, New York, NY

Calagari: 415-390-9600, Mountain View, CA

ME

Charles Ostman has spent over 20 years working with electronics, computers, and physics, including 8 years at Lawrence Berkeley Laboratory at the University of California. He may be reached at 510-549-0129, or email at charles000@aol.com

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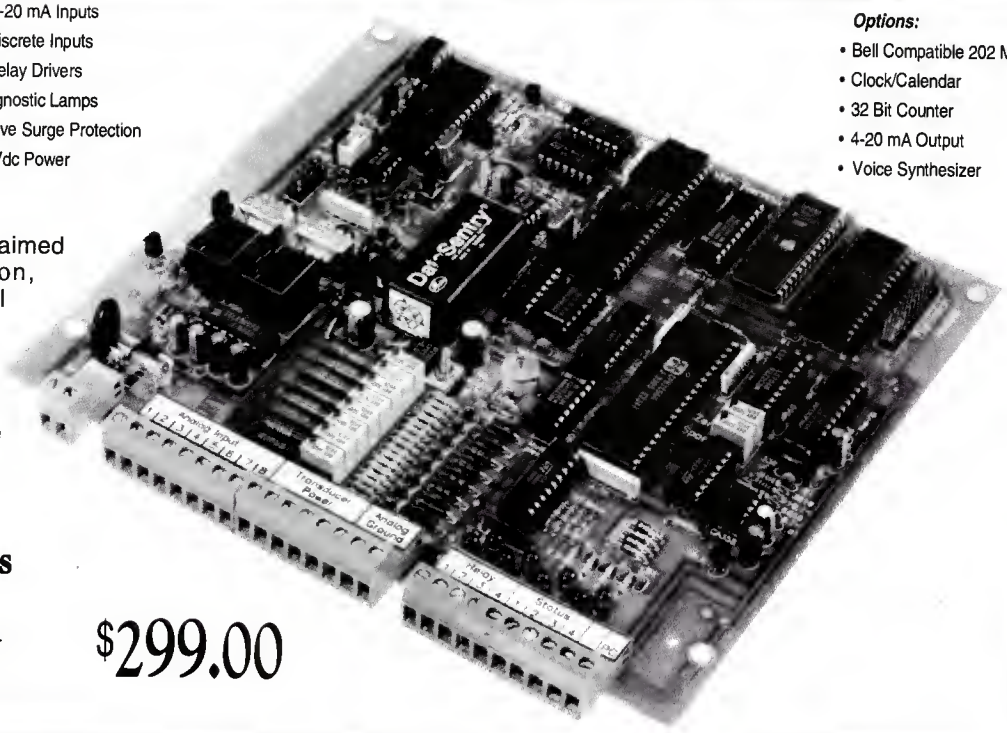

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video, the image is actually shot with a real fisheye lens which is relatively compatible with the VTV process.

But where things get truly interesting is when dual cameras are utilized (or in the case of computer generated scenes, dual virtual camera views can be utilized to render a stereoscopic equivalent image). When combined with a stereoscopic viewing system, the resulting effect is an absolutely convincing 3D experience for the viewer. Of course, particularly in the case of computer generated scenes, the parallax angle can be adjusted to best compensate for the relative "position" of viewing of the warped image field. In other words, one wants to be as near the "center" of the spherical projection as possible to minimize any noticeable distortions or unnecessary loss of resolution in the finished imagery.

There are some tradeoffs, of course. Because of the fact that the source image is remapped to the virtual equivalent of the interior wall of spherical field, there will always be a relative loss of resolution. The amount of loss depends on the ratio between the field of view as presented from the display device, and relative value of the wide angle lens (or its equivalent value) that the input image was rendered, or shot with.

For instance, consider a wide angle, fisheye lens 180 degree video source signal. If the virtual viewing camera has a relative field of view of, say, 90 degrees horizontal by 60 degrees vertical (typical 3:2 aspect ratio for most video imagery), this will translate to a dewarped output image with approximately 45% of the total pixel population at any given moment, since you are looking at a section of the total circular image region.

From a relative resolution point of view, this viewing portal can be interpreted as displaying approximately 35% of the original image data resolution. Therefore, one has to render computer image data with sufficiently high source resolution, or in the case of live video feed, use the highest available resolution source material to provide the resulting desired effect.

This is not really that much of a penalty, but rather a parameter, that the developer of a warped image stream needs to be aware of. And, as the technical data from Warp suggests, there are certain compromises that can be made between ultimate source resolution, and the apparent viewing quality of the resulting, warped image.

Most importantly, though, is that it needs to be made clear here that this is a very new development. As of this writing, Warp is in the process of licensing the "warp" process to various vendors, such as game developers, kiosk manufacturers, and the like. For obvious reasons, there are some details of this scenario which, for the time being, will remain moot until Warp decides to go public with further release information.

However, in discussions I had with Eric Gullichsen, cofounder of the company, there could be the possibility of a licensor eventually utilizing this technology as a sort of service bureau. Someone could have either live video shots or computer generated scene art converted to warp compatible image data.

A Final Note

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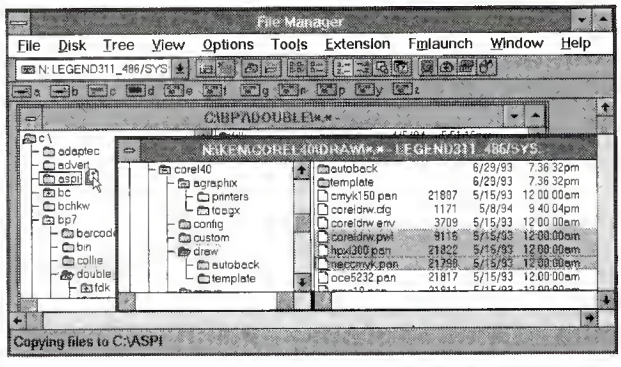

Windows software. Both give you compressed EPS illustrations for the highest quality pictures with the lowest overhead for disk space. Next, bring all pictures into your word processor, using a page size such as 8½×5½ inches (half letter) or 8½×7 (half legal).

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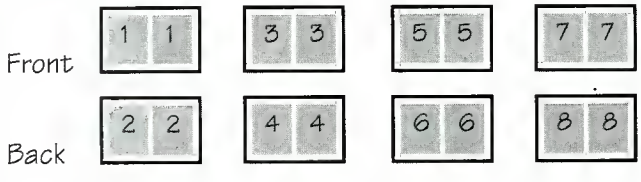

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Patent Discussions—1

by Curtis L. Harrington

Design must not be judged as a concpet. The standard of obviousness for obtaining a patent in a design case was recently examined in the case of *In re Harvey*, (CAFC 1993) 29 USPQ2d 1206, with respect to the design's underlying concepts. The case dealt with a patent applicant's vase designs having a shape represented by two intersecting geometric solids.

The examiner rejected a pair of the applicant's design patent applications after astutely identifying the designs as being formed by the intersection of two geometric solids. The first application involved a vase formed by the intersection of a "oblate ellipsoid with a pentagonal cylinder." The second application involved a vase formed by intersecting "an egg shaped revolved hyperboloid with a square frustrum." The examiner, having a keen eye and sense of geometry was able to identify each design as the combinational intersection of the aforementioned basic geometric shapes.

The examiner then cited the applicant's own prior art designs in making the rejection of the applicant's current application. With regard to both of applicant's designs, the examiner brought forth previous designs of applicant's earlier vases whose shape was formed by the intersection of a sphere with a cube. The fact that the applicant argued that numerous changes would have to be made to earlier vase designs in order to achieve an extreme metamorphosis into the designs of the applications, the Patent Office found that the differences between the earlier and applied-for designs only involved "minute" details which did not significantly impact the overall appearance.

After a generalized examination of case precedent regarding the obviousness standard in design patent cases, the court held that the Board of Patent Appeals erred by misapplying the obviousness standard to the Harvey designs. The Board had admittedly relied upon the prior art Harvey vase as a "design concept rother than for its specific design characteristics." Design patent references were held as required to be viewed specifically for its specific design characteristics.

Design patent references were held as required to be viewed specifically for its specific design characteristics.

In an expanded criticism of the standard put forth by the Patent Office, the court identified three major areas of error. First, the Board of Patent Appeals erred in extending the suggestions of the prior art far more than warranted by logical extension. For the examiner to identify known concepts upon which a design is based, and then to use those known concepts to then define the particular design based upon those known concepts as obvious, would have the effect of making obvious all combinations, especially the unobvious combinations, which are based on one or more known concepts. Thus, the combination of any two geometric solids in the art would be found to be

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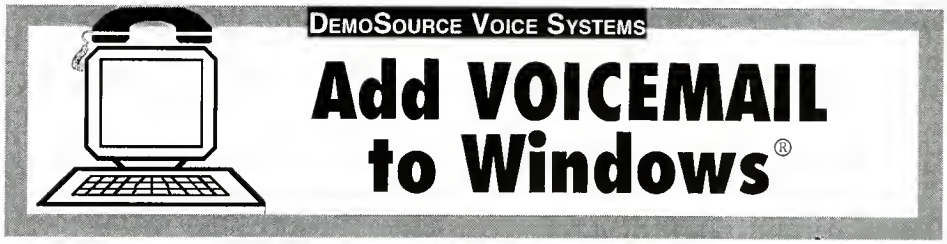
obvious, despite multi-dimensional variations their relative size and orientation. "Clearly, such a conclusion would be inconsistent with our case law on design patents."

The second error was the Patent Office's failure to find a suggestion in the prior art references that such references be combined before deciding that their visual ornamental features can be made to yield the applied for design. Third, the Board of Appeals was held to have improperly compared the visual impressions of selected separate features of the prior art designs rather than the visual impression of the designs as a whole. In buttressing its point, language from previous cases was cited such as *In re Rosen*, 673 F.2d at 390, 213 USPQ 349; "in determining the patentability of a design, it is the overall appearance, the visual effect as a whole of the design, which must be taken into consideration." The court also cited *In re Jennings*, 182 F.2d 207, 208, 86 USPQ 68, 70; "in considering patentability of a proposed design the appearance of the design must be viewed as a whole, as shown by the drawing, or drawings, and compared with something in existence - not with something that might be brought into existence by selecting individual features from prior art and combining them, particularly where combining them would require modification of every individual feature."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Giant Stuff-A-Pumpkin

A previous case, decided before the decision in *In re Harvey* also illustrates the requirement to consider the overall appearance of the subject of a design patent. In *Sun Hill Industries Inc. v. Easter Unlimited Inc.*, (DC, ED NY 1993), 29 USPQ2d 1115 the defendant was charged with infringing plaintiffs patent for its GIANT STUFF-A-PUMPKIN. Plaintiffs design patent related to a leaf bag which becomes a lawn sculpture simulating a giant jack-o-lantern, when stuffed with leaves. The giant pumpkin sculpture is 60" tall and 58" wide having a rounded bottom with a star seal closure. It has a black imprint of a scary face on one side and a happy face on the other side and vertical black lines simulating pumpkin creases.

Defendant's design included a leaf bag with only one jack-o-lantern "face" imprinted on it, no vertical lines and a slightly different bottom section than the patent design of Defendant. The defendant identified literally thousands of pumpkin designs, both two and three dimensional which existed in the prior art. Prior art included much earlier published grade-school handbooks which disclosed instructions for making a three dimensional jack-o-lantern from a folded sheet of orange crepe paper, and from a grocery bag by applying orange, black and green paint to a bag and stuffing it with newspapers and banding it at the top. In the *Sun Hill* case, the defendant admitted that his idea for a pumpkin shaped leaf bag came as a result of seeing the plaintiffs GIANT STUF-A-PUMPKIN bag, but that deliberate steps were taken not to copy plaintiffs graphic design.

In the *Sun Hill* case, a more fully detailed exploration of obviousness, the District Court cited *Litton Systems, Inc. v. Whirlpool Corp.*, 728 F.2d 1423, 221 USPQ 97 restating that a court in addressing obviousness must not take a "piece meal approach, one in which it takes the individual elements, item by item, and tries to show us that they exist somewhere in the prior art." The defendant vigorously argued that the "point of novelty" of plaintiffs design patent is limited to the STUFF-A-PUMPKIN graphics, including its specific facial features and oppositely oriented faces. The defendant further argued that there was nothing unique or protectable in the orange color of the bag, the spherical shape, or the pumpkin theme. Defendant pointed out that its product only has one face, no vertical lines, and a different bottom tuck. The court cited *LA Gear, Inc. v. Tom McAn Shoe Company*, 988 F.2d 1117, 1124, 25 USPQ2d 1913 for the proposition that "not only does the individual elements, but the ornamental quality of the combination must be suggested in the prior an." The concept in this case was "take the leaves and put them in a bag and make the bag look like a pumpkin." Again, although the inclividual elements of the design concept were old, namely leaf bags and pumkins, their combination merged into a "visual whole."

Such an overall effect of the design cannot be defeated by a slight difference of detail, "mere difference of lines in a drawing or sketch, a greater or smaller number of lines, or slight vanations of configuration... wi11 not destroy the substantial identity. An engraving which has many lines may present to the eye the same picture and to the mind the same idea and conception as another [engraving] with much fewer lines. The design, however, would remain the same" said the court in citing *Gorham Co. v. White*, 81 US (14 Wall.) 511 (1872).

In the court's comparison of the patented item with the infringing product, in terms of size, shape, graphics, and features, "the similarities dominate." In closing the court coins the phrase "ornamental gestalt" equivocating it to the "integrated and ornamental whole, for it is that whole that is new and unique and therefore worthy of protection."

It can be seen from the recent cases, and specific examples, that it is the overall effect of the designs which will merit design patent protection. The fact that the underlying concepts can be identified by the discerning mind does not serve to make obvious the designs which sprang from those concepts. To the contary, the identification of a design's underlying concept will enable and encourage designers to further combine such concepts with the vast array of other concepts which are available to result in even further varieties of novel, non-obvious, and patentable designs.

The fact that the underlying concepts can be identified by the discerning mind does not serve to make obvious the designs which sprang from those concepts.

Curtis had submitted the following as a separate article. It appeared that it would have the most value running with the patent theme in this issue. -- WEG

Marking of patented articles can be very important to damage recovery. In a patent infringement suit, damages recoverable from an infringer begin to accrue after an infringer has notice of the existence of a patent covering the infringer's activities. Of course, one type of notice which will always meet this requirement is actual notice which is had by communicating directly with the infringer. Unless the patented item is specific to a narrow and definable group of potential infringers, the burden involved in giving direct notice would be tremendous. However, notice may be presumed where the patentee, or his li-

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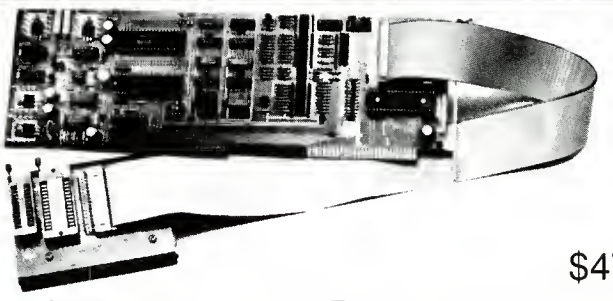

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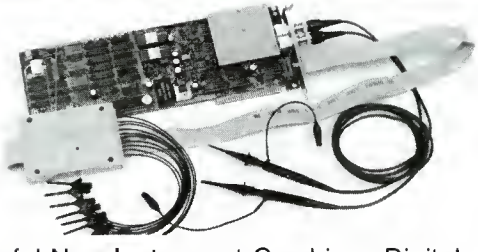

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censees properly mark the articles produced which are covered by the patent. When patented articles are properly marked, the presumed notice enables the patentee to collect money damages from acts which occur prior to giving actual, direct notice to the patent infringer.

The specifics on marking were set forth in the recent case *American Medical Systems Inc. v. Medical Engineering Corp.* (CAFC 1993) 28 USPQ2d 1321, which involved a patent relating to a prosthesis.

This mechanism comes from 35 U.S.C. section 287(a) which provides that "Patentees and persons making or selling any patented article for or under them, may give notice to the public that the same is patented, either by fixing thereon the word 'patent' or the abbreviation 'pat.', together with the number of the patent, or when from the character of the article, this cannot be done, by fixing to it, or to the package wherein one or more is contained, a label containing a like notice. In the event of failure so to mark, no damages shall be recovered by the patentee in any action for infringement, except on proof that the infringer was notified of the infringement and continued to infringe thereafter, in which event damages may be recovered for the infringement occurring after such notice."

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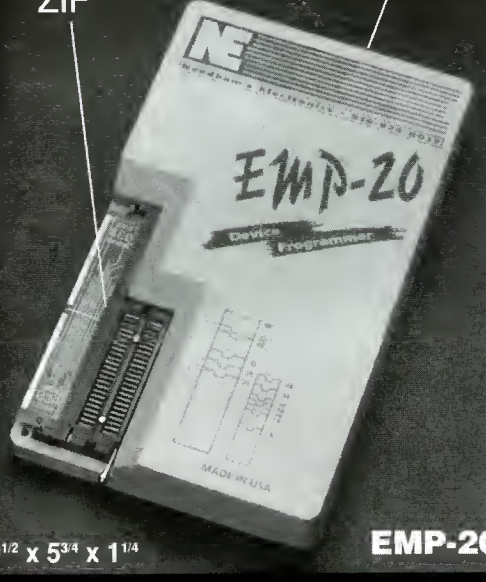

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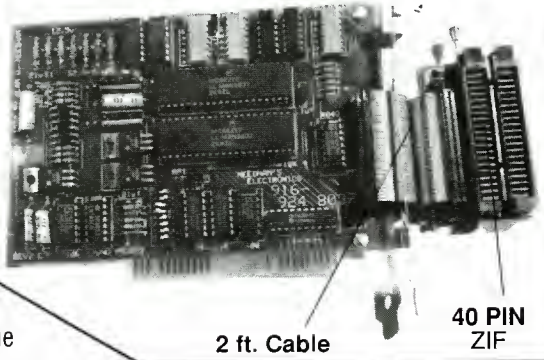

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What's GIS?

by Stephanie Routh

Geographic Information Systems (GIS) is the latest technology to answer the question, "Where am I and what else is around here?" You may have seen it referred to as part of the technology behind rental cars in Orlando, FL that can produce electronic maps and routes actually in the car to help you get to your destination. GIS is also used by the US Park Service and Forest Service to manage the resources in their areas. Private engineering firms, utilities, planners, surveyors, geologists, environmental scientists, architects, marketing research, transportation consultants and other firms that traditionally use CAD or CAM systems are beginning to use GIS as an alternative to straight AutoCAD. But what is GIS specifically?

GIS has been described as a "small" mapping or CAD system. GIS goes beyond AutoCAD and other packages in that it is a relational database attached to an electronic mapping package with a GUI frontend. GIS stores the relationships among objects on a map and allows the user to ask the question "If I am here, what else is near me, or 10 miles away from me." This is not a question that is easily answered in a typical relational database, because the question is locational or spatially oriented. It is very difficult in Dbase, for example, to calculate what 10 miles from a particular location is if you only have an address to work with. In AutoCAD, the relationship among objects is not stored, although you could measure the distance on the screen with the mouse and look at what falls within a radius of 10 miles from the center point and write it down yourself. "What is 10 miles from me?" is easily done if you have good locational data in a GIS system.

The bane of many databases is good locational information. This is the number one downfall that prevents their use in GIS environments. Those awful things called "coordinates" are absolutely necessary if data is to be used in a GIS. With the idea of coordinates comes other words that people don't want to hear like "accuracy," "precision," "latitude and longitude," "scale," and "projection system." All of these are words that people have avoided since their high school geography classes. There are ways to get around the inclusion of straight geographic coordinates for locational information. Addresses, zip codes, and area codes are indirect methods of recording geographic location. Many of the more powerful GIS systems can take information in this format and with the addition of a coded base file can convert an address into an actual geographical coordinate (i.e., latitude and longitude).

The real power behind a GIS system is not these nice graphic and electronic mapping capabilities, but the analytical potential of the system. On paper maps, only so much information can be stored and recorded before it gets too messy and unreadable. The GIS can store as much information about a location as you can imagine and only display the data you are interested in. Data sets that formerly had no links together can

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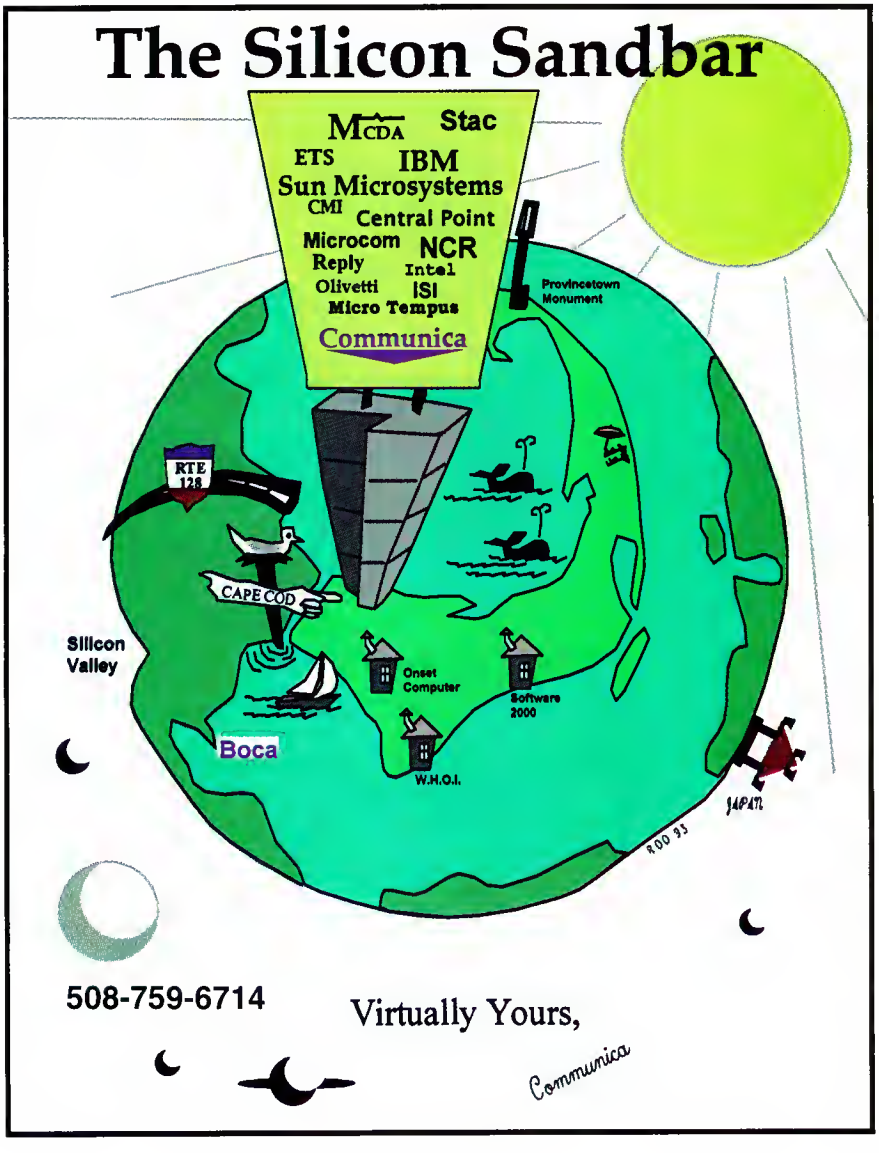
be used at the same time because they have locational information in common.

For example, let's say I wanted to find a location to build my next house. I know I would like to be within walking distance of schools with a good ethnic mix of students, near two fast food places, on a hillside overlooking a lake, and in a house that was owned by only two other families. Does this sound like an impossible question to answer? Before GIS, my real estate agent would just have given me a blank stare and patted my head and said "How about just a house with a pool instead?" These data sets are very diverse and unrelated, right? Well, they do have something in common. I am asking for information about a location and all of the data about schools, fast food, lakes, terrain, and real estate are linked through this locational information. It is just a different way to look at the problem.

Other types of analytical questions that are popping up in the GIS world are "Can you route my delivery truck from A to B stopping at points 1, 2, and 3?" or "Where are all of the agricultural lands that produce soybeans along this rural route so I can sell them my fertilizer?" Engineering-wise, we have "Tell me the different types of materials used to maintain this stretch of road and show me a map of the sections which have had to be constantly repaired over the last two years?" or "In this house, show me the locations where electrical conduit runs within one foot of telephone cabling and water pipes?" These questions all relate to different problems and different scales of information, but they can all be answered in a GIS environment because they are all questions about the location of things.

GIS packages are available for just about any platform you can imagine. Prices range from shareware to $25,000 systems. The more features you want, or the greater the data volume to handle, the more expensive the software. Software leaders in GIS are ESRI, Intergraph, GRASS, AtlasGIS, MapInfo, and several others. There is a need for serous training in GIS before you just jump in. Think about the questions your company asks most often and then ask some of these vendors if their GIS can handle your needs. I'm sure their sales people would talk your ear off. Data for GIS work is the most difficult to come by. There are commercial vendors of prepackaged data as well as data from state and federal agencies available in popular GIS formats. Your own data will work as well as long as you have included that locational information in your databases.



Stephanie Routh is a Master's student Ohio State University. Stephanie and her husband David are looking to move to the Southwestern U.S. and work with GIS for environmental, archaeological, geological, or other engineering firms. Stephanie can be reached via e-mail at: srouth@magnus.acs.ohio-state.edu or trigan@aol.com

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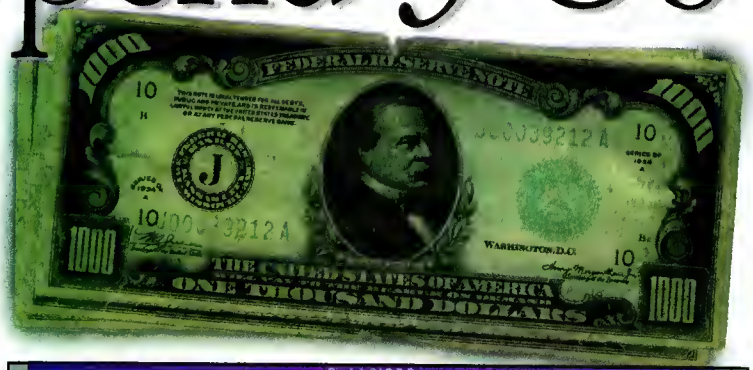

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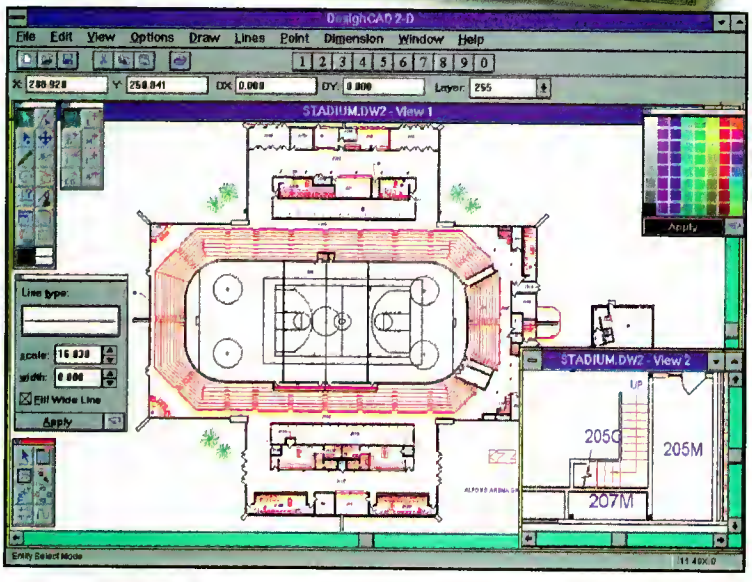

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Reader Service Number 18

Component-Oriented Software

by Jack Krupansky

Pitfalls and Opportunities

Objects have been pitched as the miracle cure for all software ailments. Beyond the hype of object technology (OT) are a lot of hard-core opportunities for entrepreneurs to make both a lot of money and serious contributions to improving the state of the art of software development.

The term component oriented software (COS) describes the shift from monolithic custom software to modular software built from reusable objects. I'd like to explore a number of interesting aspects of this shift and identify numerous business opportunities.

Object technology is based on the core concepts of object-oriented programming (OOP) as popularized by the Smalltalk and C++ languages. Component oriented software is an attempt to take the OOP concepts that are used within an application and use them across applications. For example, a Visual Basic custom control extension (VBX) is a chunk of shared code which can be used in multiple applications (including those developed in C/C++) without even re-linking the application.

Even if Microsoft wins there will still be lots of opportunity to capitalize on the gaps.

The boundaries between traditional software modules tend to be poorly defined and the resulting software systems are expensive, not very reliable, and difficult to maintain. Each new project tends to start from scratch.

COS focuses on sharing code using a more robust architecture based on well defined components in much the same way as hardware is designed. OOP proponents talk about the benefits of "reuse" of objects. COS actively promotes and facilitates that reuse across applications.

A COS developer assembles components to construct a complete software system. Components may themselves be constructed from other components and so on down to the level of pre-built components or old-fashioned code written in a language such as C, assembler, or COBOL. Visual tools or actual code can be used to "glue" components together. It's practical to do simple applications using only "visual glue" (e.g., by "wiring" components together as in NEXTSTEP or Digitalk's Smalltalk PARTS or IBM's VisualAge). At some level, though, somebody will be writing function calls and expressions that sequence control and data flow between components. For entrepreneurs there will be business opportunities in both the components and the glue.

Most OT is under the hood and shouldn't be visible to end users. The impact to users will come from faster product development cycles, increased flexibility, and improved customization features. COS will allow independently developed applications to work together and to do so more efficiently and with less development effort.

Although the underlying ideas of COS have been around for some time we need to build up an infrastructure that fully supports COS. Critical issues for success of COS are:

* Dealing with Hyper-Hype and Oversell
* Commercial evolution of OT
* Common object model
* Application Frameworks
* Compatibility & multiple sources
* Specifications
* Data books
* Component management
* Licensing models that facilitate reuse and profit
* Evaluation versus production use
* Discipline for producing truly robust software
* Intellectual property
* Distribution models
* Model-View-Controller Paradigm
* Training
* Consulting
* Testing
* Tools
* Disincentives for Reuse

As these issues are addressed we will see increasing effectiveness of OT. Dangling issues will lead to intense thrashing and anxiety, skyrocketing costs, and slow progress. But since we entrepreneurs live by dangling issues, they are opportunities to apply our energy and talent in ways that impress the heck out of mere mortals and induce them to pay lots of money to gain access to our solutions.

Hyper-Hype and Oversell

As OT hype becomes accepted, then the real problems begin. Everyone is

saying that "OT is here today and so easy to use. You'll be five to ten times as productive. New projects can reuse existing code. You can even reuse 'legacy' code. Training is a snap. Maintenance costs will go way down. All the tools you'll ever need are here today."

The mark of a good engineer is their ability to quickly sift through irrelevant and misleading drivel and determine what details really matter. Don't let all the vender hype convince you that you're no longer needed. And don't give up on OT just because you find the hype offensive. Sift though the garbage and identify real gaps and then work on real solutions.

Commercial Evolution of OT

Some of the big players in the commercial OT field are Microsoft, Taligent, NeXT, HP, IBM, Apple, Digitalk, and ParcPlace. Each has their own approach to OT and it is not very clear whose approach will win over the long run (other than Microsoft.) In a recent interview in Software Magazine Steve Jobs of NeXT said that it's in Microsoft's best interest if NeXT becomes successful because they'll give him something to copy for the rest of this decade.

Even if Microsoft wins there will still be lots of opportunity to capitalize on the gaps. One opportunity is for system tuning and optimization. Nobody has ever accused Microsoft of producing the most optimal and flexible system software. The real beauty of OT is the ease with which objects can be pulled out and replaced. Of course, this has really been true all along even in DOS where you can plug in device drivers. Novell and Stac are great examples of how to succeed with low-level system software even when you don't control the operating system.

With objects it is very difficult to understand the flow of control just by looking at a diagram or even actual source code. With polymorphism (applying the same function name to different types of object) a single function call can go to different places based on the actual object value. Some careful analysis and lots of legwork walking through all code paths can tell you most of the places that message might go (although with Smalltalk it could go anywhere), but a diagram of that level of flow will be quite a jumble of spaghetti. On the other hand, when the software is actually being run by a specific user the flow may be to a much smaller number of places or even exactly one place or maybe the code never even gets executed. I can imagine all sorts of neat tracing and logging and optimization tools to help developers and system administrators maintain their sanity.

Microsoft is pitching OLE (object linking and embedding) as the way to go for object-oriented software. It is very complicated and there is a significant impedance mismatch between it and OOP languages. What a mess. And what an opportunity for consultants and tool builders!

OT needs to evolve away from dependence on specific architectural features. For example, Microsoft's Visual Basic custom controls have a 16-bit architecture that is being redesigned for 32-bit machines. Microsoft has a new technology called OCX based on OLE. All you have to do is convert your code. Whadaya mean your vender doesn't have an OCX version of that whizbang fax control for Windows NT running on the IBM PowerPC yet?!?

The bottom line is that although the basic concepts of OT and COS are fairly simple there will be a great deal of evolution for at least the next ten years. The only thing we'll be able to count on is change. But that's all us entrepreneurs care about anyway.

Common Object Model

All objects are not created equal. Even factoring out syntax differences, Smalltalk, C++, and OLE objects are significantly different. C++ gives you maximal compiled efficiency for object operations. Smalltalk gives you maximal interpretive flexibility for inter-object operations. IBM's System Object Model (SOM) attempts to provide language-independent object support. The Object Management Group (OMG) has defined the Common Object Request Broker (CORBA) to support OT serv-

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ices at the system level. And I have my own language, Liana, which has Smalltalk's flexibility using C++ syntax. Object FORTRAN and object COBOL are just around the corner!

Sure you could construct the subassembly yourself, but if the price is right why bother.

There are also differences between small objects and system level objects. C++ and Smalltalk have good support for small objects equivalent to C structures and Pascal records. OLE, VBX, SOM, and CORBA are oriented towards big, system level (and network level) objects. Each technology has its own quirks and performance characteristics and it is not easy to move between the worlds of small objects and big objects. If you want to do a medium-size object then you have to force it to be small or big. We need to evolve towards a better match of features.

There is a lot of commonality in objects such as an object being defined by a class and each class consisting of data and code and support for data abstraction, polymorphism, inheritance, and late binding. But then there are lots of fringe areas where differences become very significant and prevent true interoperability. Data abstraction allows a class to control what features of the object are accessible from other objects. Whereas Smalltalk strictly prevents other objects from directly accessing an object's features (called instance variables), C++ gives the programmer the ability to individually specify the access to the object features (called data members) to be as strict as Smalltalk (private) or as unlimited as C (public) with some other variations in keeping with the spirit of C.

Unfortunately, with so many variations and choices it's hard to develop a component that will be usable across the entire software community. Of course, that does provide an excellent opportunity for consultants to do things like convert slow Smalltalk code into efficient C++ or messy C++ code into flexible Smalltalk. Or to recommend to the MIS director that he fund simultaneous, competitive teams to implement the same pilot project in both Smalltalk and C++ and see for himself how each can fit into his organization and business requirements.

I expect that a vender-neutral common object model will evolve with translators that can convert to and from each of the language-specific object models. Each language would then evolve to support the common object model. Some of us will make some money from this translation business.

Application Frameworks

The basic idea behind an Application Framework (AF) is that a lot of the work is already done for you. An AF is the skeleton of an application and you just fill it out. But today the term is casually misused to refer to any class library. Technically an AF is a coordinated collection of classes which are designed to work together towards solving some problem. The real issue is not whether some classes are an AF, but how functional, complete, and consistent it is.

While today's AFs are generic tools to be applied to many problems, the crying need will be for what I call domain-specific class libraries. These will be AFs that are already well filled in for specific types of applications. There will be less drag-and-drop and more fill in the blank. Not that all applications will reduce to this model, but people will be willing to pay lots of money for carefully thought out AFs that eliminate much of the tedium of programming.

There is also an area between discrete components and full-blown AFs: subassemblies. Just as in hardware, there is significant value to the customer when a carefully constructed assembly of components can be bought off the shelf. Sure you could construct the subassembly yourself, but if the price is right why bother. Lacking decent terminology, a subassembly will also be called an AF. Examples are a class library for dealing with communications ports, functions for data encryption, class support for MIDI devices, pattern matching functions, a spelling checker, etc. These would all be components, but somehow we need to differentiate between simple, discrete components, elaborate subsystems, and full-blown application frameworks. Of course, the real distinction will be in pricing and if you want to make bigger bucks then just do more for the customer.

Both NeXT and Microsoft have started efforts in this area, but since there are so many different applications and many of them are very niche oriented, there will be lots of room for us little guys to stake our claim.

Compatibility & Multiple Sources

As in hardware, there are many benefits to having compatible components available from multiple venders. Competition keeps prices reasonable and encourages enhancements. Risk is reduced by avoiding dependence on a single vender. COS can't flourish if most components have a single source.

Some of us will make some money from this translation business.

Compatibility will require some agreement on specification for components. Even with compatibility there is still opportunity for feature differentiation. Performance, size, cost, and licensing terms may vary. The spec says what features the component must meet. It won't prevent a vender from offering more features. Components should have a compatibility mode which forces the component to restrict its behavior only to the features in the specification. With that mode you won't have to worry about building your software around one vender's component and then later realize that you can't simply replace it with a "compatible" component due to use of an extra feature.

There will be plenty of opportunities for seasoned, disciplined engineers to define and enforce standards, to design standards for compatibility, and to guide component venders in producing compatible components.

COS will require better techniques for developing and distributing ***specifi-***

cations. Graphical diagrams are useful and there are many graphical CASE (Computer Aided Software Engineering) methodologies. Concise prose, pseudo-code, and simple two-dimensional tables (such as decision tables) are equally important. And sometimes a carefully annotated C header file can end up being a lot more useful than a notebook full of CASE diagrams.

Components from different venders cannot be easily compared unless similar specification techniques are used. COS needs standards for specifications.

One of the benefits of UNIX was its de facto standards. There is a common language (C), a common runtime library, common string handling and memory management, common tools, and an elegant way of connecting tools together. And UNIX provided lots of examples of good code. The original developers worked out all the kinks before any of us mere mortals came into the picture. But for COS we are all starting out almost from scratch and we don't even have standards for things as simple as strings or memory management let alone any large examples of COS.

We also need better terminology for discussing objects. Each CASE methodology has its own jargon and symbols. I suspect that everything we really need is already out there in some form and we just need somebody to pick though it and engrave just the right combination in stone.

Standards are more effective when enforced by tools that embody those standards. Lots of opportunities here for standards, tools, templates, and style guides.

COS needs really good ***data books*** analogous to those of the hardware guys. We need a good taxonomy for cataloging software components. We need good specifications for components. Venders of compatible components need to use common terminology and formats so developers can easily do objective comparisons. The ObjectWare catalog from NeXT is a nice try, but even it is rather minimal.

What exactly does a COS data book look like? Is it a CD-ROM with Microsoft Windows Help files? Is it online? How is it be indexed? How often is it be updated? By whom? Can we get hard copy? Will the information be stored in easily accessible text and graphics file so we can write neat little macros to do custom searching and custom formatting? More opportunities for entrepreneurs! Are you interested enough to take a shot?

In another issue, I'd like to examine additional technical and business issues. OT and COS will be truly fertile ground for the entrepreneurs among us.

ME

Jack Krupansky runs a one person software business, Base Technology, which develops and markets the Liana object-oriented programming language and offers Windows software development consulting. He may be reached at 303-440-4558, Fax at 303-444-4186, e-mail at 70642,2662 on CompuServe, or snail-mail at 1320 Pearl Street, Suite 110-B, Boulder, CO 80302.

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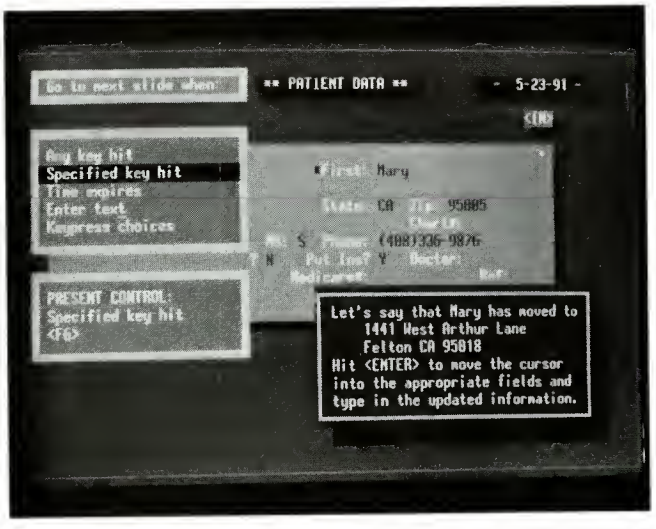

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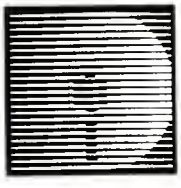

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Multiple Meters and Budget 'Bots

by James Ulrich

Small companies, like where I work, everyone wears many hats. Sometimes I'm a technician, or programrner, or draftsman, or engineer, etc. It has been my pleasure to do a lot of development work with the New Micros' MaxForth processors. I would like to relate some of my efforts regarding this capable little chip.

First, I would like to give some background on why I use this chip. Its core is a Motorola 68HC11, which has a wealth of on-board resources. It packs an 8-channel A-to-D converter, a robust timer system, on-board RS-232, and a high-speed synchronous serial interface. These features make the 'HC11 very versatile in small control applications. My other reason for using the New Micros version is their Forth interpreter/compiler resident in internal ROM. This allows for developing the software directly on the target system. Forth also allows some very flexible programming. I'll cut short my stand on the soap-box by saying that I am a confirmed Forth junkie.

We discovered that, though the meter had a 6-1/2 digit resolution, if internal averaging was used (one of the nifty math features) we could get 7-1/2 digits!

I became interested in small control computers when we started working on a project to control high-voltage power supplies for analytical chemistry applications. Previous controls involved manual control of potentiometers and monitoring feedback from panel meters. It became evident that a computerized control (with its inherent repeatability) would aid some applications — a must for comparing results of several test runs.

One obstacle our company faced was cost control on the project. Specifically, how many additional I/O chips we could do without? It appeared that this would require an external 12-bit Analog/Digital converter to replace the discrete panel meters. Concurrent to this we had just purchased a new HP 34401 DMM. We discovered that, though the meter had a 6-1/2 digit resolution, if internal averaging was used (one of the nifty math features) we could get 7-1/2 digits!

It occurred to me that a similar scheme might be used to increase the resolution of the built-in A/D of the 'HC11. It took several days of fermentation before the scheme was fleshed out and I was able to synthesize 4 near-12-bit resolution results out of the on-board 8-bit A/D. The method was actually quite simple, requiring the integration (as in calculus) of the results of several samples in realtime.

Don't let the calculus scare you off; it was actually quite simple to implement. For each channel it was necessary to keep a running sum of the past 16

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samples. This was numerical integration at its simplest. To make the routine run fast, each channel has a circular list of the past 16 samples and a variable holding the running sum. Before a new sample is added the last sample in the list is subtracted from the running sum. Then the new sample overwrites the last sample, and its value is added to the running sum. To make the process automatic, this procedure was implemented as an interrupt service routine. Once the interrupt was initialized and enabled the end user only needed to read the corresponding sum as if it were a 12-bit register.

It immediately occurred to me that radio control servo motors could probably be controlled rather nicely from the 'HC11.

Some Caveats

I've stated that this is "near-12-bit." That came from the simple math that the sum of 16 8-bit samples could yield a maximum value of 4080 counts *vs* 4096 for a true 12-bit conversion. Another problem that could arise was aliasing, or sampling error due to the routine running on a regular periodic interrupt. An appropriate low-pass filter was used on the analog inputs to minimize that effect.

The plusses? It worked. It worked well. In order to get "meaningful" results I wrote some Forth scaling words that converted each channel's sum to a scaled digital voltage. For example if the maximum result represented 5 volts, then the scaled results would be in the range of 0 - 5.00 VDC. Our company also provided ISO-9000 calibration, so I checked the performance of my little multiple-meter. Each channel was accurate to within +/- 1 count on the least significant digit!

The code in Listing 1 is as generic as I could make it. I've made notes as to how to adjust the code if it is ROM targeted.

Something Different

The professor our company has been working with suggested that some small scale automation added to his CZE stations would be a great help. This would help in removing the tedium and inaccuracy of manually manipulating sample vials, capillary tubes, and hi-voltage electrodes. He showed us an example of a machine built for him involving many pneumatic pistons and controlled by a PC-clone (the setup was not working because the digital I/O card had long past given up the ghost). It immediately occurred to me that radio control servo motors could probably be controlled rather nicely from the 'HC11.

I started by going to my favorite hobby shop and asking for the cheapest servo motor they had in stock.

I started by going to my favorite hobby shop and asking for the cheapest servo motor they had in stock. They sold me a Futaba FP-S148 for $15. They also made copies of the sketchy data sheet from a more costly servo kit. The only information I could glean was that the servo produced about 3 inch/pounds of torque, it operated from 4.5-6.0 VDC, and that position information was provided by a pulse width modulated signal.

Unraveling The 3-wire Interface

Opening the servo and examining the circuit board revealed the power and ground connections, leaving the third wire for position command. After hooking up the servo on my bench I started playing with a pulse generator and digital counter. I soon discovered that the position command was a positive pulse, .24 mSec to 2.4 mSec wide. Usable pulse periods varied from a minimum of 10 mSec to a maximum of about 30

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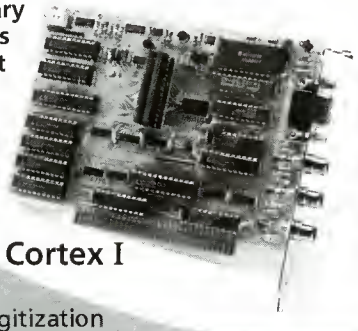

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mSec. Armed with this data I was able to devise a control scheme using the output compare functions of the 'HC11 timer system.

The timer system of the 'HC11 was quite capable of acting as a low frequency (approx. 32 Hz) pulse width modulator with no interrupts required. One time comparator acted as a master reset, while the remaining four actually set the pulse width. All that was required was setting the appropriate registers, and writing the pulse-width data directly to the four time comparators. This meant that no interrupt routines nor any special timing loops needed to be written. The resolution was 500 nSec, and each comparator was 16 bits wide. This gave a period of 32.xxx mSec, just inside the stable control region of the Futaba servo. I cobbled some code and hardware to prove the basic scheme, and it worked perfectly.

Tight Code

The next challenge was fitting the control code and the operators interface all within 512 bytes (that's BYTES, not Kbytes nor Mbytes) of onboard EEPROM. My goals had to be rather modest. I wished to control four servos. Two servos were to move between two user-defined end points. The other two servos would be able to move in a ten step user-defined sequence. I wanted a small number of digital outputs to signal or control related operations, some digital inputs to select endpoint positions, and to allow the user to halt the sequence at selected steps. The operator interface would be a set of four pots for position control, several switches for mode selection, and a single digit LED readout showing the current sequencer step. Again, I wanted to fit all this into an 'HC11 in its single chip mode.

I chose to develop my code on the New Micros Drop-Point computer; an 8 MHz 'HC11 in its unexpanded mode, an RS-232 level translator, and circuitry to thieve power from the host RS-232 port. Because Forth is its own compiler, a PC was needed only for text editing, code storage, and serial communications. The downside was that the chip had only 512 bytes of ram, 296 reserved for the OS, leaving 216 bytes for code develop-

```
( ========== )
(            )
( LISTING 1  )
(            )
( SYNTHESIZED )
( 3-1/2 DIGIT )
( METER      )
(            )
( ========== )

VARIABLE AVE-0
VARIABLE AVE-1
VARIABLE AVE-2
VARIABLE AVE-3
VARIABLE ADC-IX
VARIABLE SAMP-TBL 3E RAM.ALLOT

HEX
FF0 CONSTANT AD-MAX

DECIMAL
VARIABLE VM-CAL
  5000 VM-CAL !

VARIABLE VM-DP
  3 VM-DP !

HEX

: FORMAT.MEAS ( VAL DPL -- ADDR COUNT  4 DIGITS ASSUMED )
    >R ABS 0
    <#
        R@ ?DUP
        IF 0 DO # LOOP THEN
        2E HOLD
        4 R> - ?DUP
        IF 0 DO # LOOP THEN
    #>
;

: VM.SCALE ( reading -- scaled-value , transform adc reading TO voltmeter)
    VM-CAL @ AD-MAX @ */
;

: VM.FORMAT ( value -- addr count )
    VM-DP @ FORMAT.MEAS
;

HEX

CODE READ.ADCS ( -- , sample the adcs and sum them into averaging regs )
    183C ,              ( PSHY )
    F6 C, ADC-IX ,      ( LDAB ADC-INDEX )
    CB04 ,              ( ADDB #4 )
    C43C ,              ( ANDB # 3C )
    F7 C, ADC-IX ,      ( STAB ADC-INDEX )
    CE C, SAMP-TBL ,    ( LDX #SAMPLE-TABLE )
    3A C,               ( ABX )

    FC C, AVE-0 ,  .    ( LDD AVERAGE-0 )
    E000 ,              ( SUBB 0,X )
    8200 ,              ( SBCA #0 )
    188F ,              ( XCDY )
    F6 C, B031 ,        ( LDAB ADR1 )
    E700 ,              ( STAB 0,X )
    183A ,              ( ABY )
    18FF , AVE-0 ,      ( STY AVERAGE-0 )

    FC C, AVE-1 ,       ( LDD AVERAGE-1)
    E001 ,              ( SUBB 1,X )
    8200 ,              ( SBCA #0 )
    188F ,              ( XCDY )
    F6 C, B032 ,        ( LDAB ADR2 )
    E701 ,              ( STAB 1,X )
    183A ,              ( ABY )
    18FF , AVE-1 ,      ( STY AVERAGE-1 )
```

```
    FC C, AVE-2 ,        ( LDD AVERAGE-2 )
    E002 ,               ( SUBB 2,X )
    8200 ,               ( SBCA #0 )
    188F ,               ( XCDY )
    F6 C, B033 ,         ( LDAB ADR3 )
    E702 ,               ( STAB 2,X )
    183A ,               ( ABY )
    18FF , AVE-2 ,       ( STY AVERAGE-2 )

    FC C, AVE-3 ,        ( LDD AVERAGE-3 )
    E003 ,               ( SUBB 3,X )
    8200 ,               ( SBCA #0 )
    188F ,               ( XCDY )
    F6 C, B034 ,         ( LDAB ADR4 )
    E703 ,               ( STAB 3,X )
    183A ,               ( ABY )
    18FF , AVE-3 ,       ( STY AVERAGE-3 )

    8610 ,               ( LDAA #10 )
    B7 C, B030 ,         ( STAA ADCTL )
    1838 ,               ( PULY )
    39 C,                ( RTS )
END-CODE

: INIT.METERS ( -- , initialize a-d subsystem and averaging software )
    B039 C@ 80 OR B039 C!
    10 B030 C!
    AVE-0 OFF AVE-1 OFF
    AVE-2 OFF AVE-3 OFF
    ADC-IX OFF
    SAMP-TBL 40 ERASE
;

( SET UP ALL INTERRUPT CALLS )

CODE-SUB CLR.INT.MASK
    0E39 ,
END-CODE

: SET.INT.VECT ( vector eeadr -- if not jsr then add it )
    DUP C@ 7E = 0=
    IF 7E OVER EEC! THEN
    1+ 2DUP @ =
    IF
        2DROP
    ELSE
        OVER >< OVER EEC! EEC!
    THEN
;


CODE INT.RTI
    BD C, ' READ.ADCS CFA @ ,
    ( PLACE ADDITIONAL SUBROUTINE CALLS HERE )
    8640 ,
    B7 C, TFLG2 ,
    3B C,
END-CODE

: INIT.INT.RTI ( -- )
    [ ' INT.RTI CFA @ , ] LITERAL
      B7E6 SET.INT.VECT
    TMSK2 DUP C@ 40 OR SWAP C!
;

: INIT.INTS ( -- )
    INIT.INT.RTI
    CLR.INT.MASK
;
```

ment. As each new routine was compiled it could then be transferred from ram to EEPROM. This helped ease the constraints of tight memory. I chose to separate header information from code so that only code was stored in EEPROM. Headers, the data structures containing routine names and locations, were shunted to high ram. Code was first written to lower ram, then moved to EEPROM. That way the code ram was always at its maximum usable size.

The remaining hard part was keeping the symbol list (the names and locations of the routines) as small as possible. One strategy was to make each routine's name very small, keeping it down to two to four characters. Even with that I ended up overflowing my symbol space. To fix that I wrote temporary code that would remove routine names after their last reference. The pointers in the linked list were adjusted and then the list was shifted down, overwriting the discarded data. This routine took advantage of Forth's ability to recurse, like many other high-level languages. After each use of the "RM" code was then forgotten, freeing up the memory it used. Part of the process used instructions that the Forth interpreter executed, thus not occupying any code space.

The Drop Point computer was used to construct a test system. This had a hastily constructed front panel with my desired controls, power supply (for the servos), four servos approximating the end configuration, and cabling. Throughout the development process it was apparent how much memory each routine took. Comparing high level Forth code with hand coded machine instructions, I was able to use Forth where

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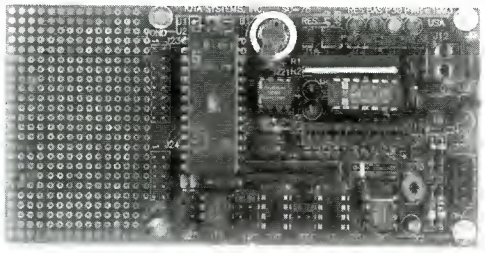

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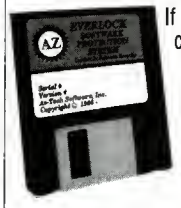

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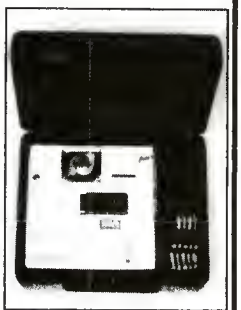

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possible and machine code where absolutely necessary. After several iterations and 3 weeks of devoting my sparse spare time to coding, I finally had my test bed working. With just 7 bytes to spare I was able to demonstrate that the concept was workable: control of four axes on a standalone basis, with an absolute minimum of components. Listing 2 (to be shown in the Nov/Dec issue of ME) is the complete code for my simple robot.

I hope that these examples will help anyone interested in developing small embedded computer applications. I intended to show some practical applications of Forth, rather than the usual introduction to a bizarre control language that most articles on Forth are. Forth shines in embedded control with its immense flexibility and reasonable speed. The Forth compiler/interpreter, including available IEEE floating point math, takes up only 12K of ROM. Can't find that in many computers these days! Won't get that from Microsoft either.

ME

James Ulrich may be reached at Chamonix Industries, Inc, POB 230, Johnson City, NY 13790, 607-729-5022.

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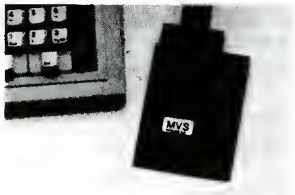

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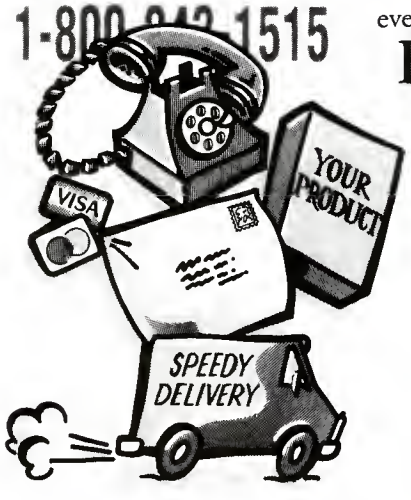

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Startup

by Mark E. Battersby

Starting a parttime or "moonlighting" business might begin as a way to profit from an existing hobby or a special interest. Whether that business activity succeeds, however, depends largely on common sense and what the Midnight Engineer views as success.

As most Midnight Engineers are already aware, the income from any activity is taxable. That income, of course, may be reduced by the expenses of the hobby in order to legitimately eliminate a tax bill. However, it is only a "business" which can go one step further by using the amount by which the activity's expenses exceed its income (losses) to offset taxable income from other sources. Thus, when starting any business, close attention should be paid to convincing the Internal Revenue Service that a taxable business exists — even if profits are not a goal.

Not too surprisingly, many Midnight Engineers are more interested in convincing the IRS that the activity is operated with "an intent to show a profit" than in actual profits. A key factor in convincing the IRS is maintaining books and records for the activity. But records usually only document business activities while bookkeeping systems measure the income and expenses.

Common sense is the one service a Midnight Engineer can't find or buy.

Common sense dictates the establishment of a goal and charting a course of action to achieve that goal. The tool most often used is a business plan. Even better, that business plan will help guide the Midnight Engineer to whatever goal is desired, help convince the IRS that a business exists for income tax purposes and, with little modification, also help attract the financing or capital needed to reach that goal.

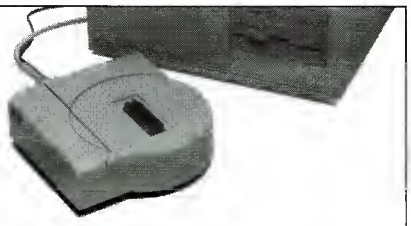
During the preparation of a business plan, Midnight Engineers will discover many areas where they lack necessary skills or knowledge. Since one of the criteria the IRS has adopted for determining the existence of a business is the skill of the principals — or their advisers — the discovery of a lack of skills or knowledge exposed during the preparation of the business plan should result in a search for qualified advisers. But where can these experts be found?

Common sense dictates that after determining just what types of experts will be of benefit, the needed individuals can usually be found among acquaintances, business associates, and friends or by asking them for recommendations. But, every Midnight Engineer should keep in mind that an insurance broker, lawyer or accountant who is familiar with entrepreneurial-type businesses may not be easy to find. But is that extra knowledge really essential?

Another pitfall to be avoided with experts is too much service. You will usually pay extra for a lawyer specializing in a particular field (or pay more for an inexperienced lawyer or accountant who must research unique questions), but there is also such a thing as too much service.

Most small business startups do not need, nor can they really afford, the full services of an accountant. A hand in setting up the proper books and records with, perhaps, the preparation of income tax forms is all that is required by most Midnight Engineers. Similarly, beyond a few basic legal services and initial startup or compliance advice, most of us don't have the need to pay a lawyer an annual retainer.

Advice should also be sought on the operating entity of the business operation. Many Midnight Engineers operate their businesses as sole proprietorships, merely attaching a Schedule C to their



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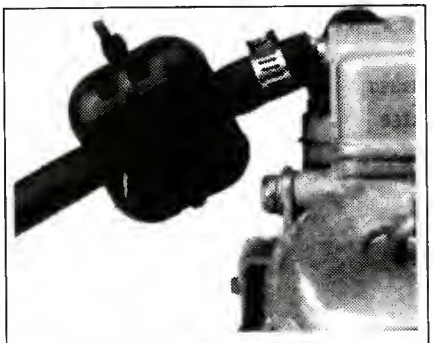

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personal income tax returns. Others band together with friends or relatives to form a separate tax entity known as a partnership. While the partnership passes all of its income and deductions to the individual partners, it is required to file an informational tax return explaining the distribution of that income and tax benefits.

Sometimes, the corporate form of doing business works best. The corporation, after all, is a separate, tax-paying entity that can legitimately offer a number of fringe benefits to its owners/shareholders. However, since it is unlikely that a startup business will be able to afford those benefits, perhaps a pass-along entity called an 'S' corporation might be more appropriate.

While offering mostly an illusion of the limited liability of a regular or 'C' corporation, the 'S' corporation passes along the inevitable losses to the shareholder for use in reducing their individual tax liability.

When discussing the business plan and operating entity with the operation's advisers, thought must be given to financing the fledgling enterprise. This should include the increased availability of funds to those Midnight Engineers operating as corporations. Bankers and other investors are more likely to invest or lend to corporations where the risk of running afoul of local usury laws is greatly reduced. Naturally, few small enterprises will obtain any financing without the owner/shareholders personal guaranty.

Unfortunately, today few fledgling businesses—or their owners—qualify for conventional financing (with or without the personal guaranty of the owner/shareholder), even if a sympathetic banker is consulted during the search for expert advisers. It is here that our basic business plan again proves its value. Most Midnight Engineers will walk into a bank and apply for a loan with the first clerk they encounter. A successful loan applicant uses a version of their basic business plan called a "loan proposal." Employing this approach you can shop for a compatible banking executive or branch manager, taking into consideration which of the many services the bank sells and which might benefit the new business. The result will be a banker who takes an interest in the business operation, affordable banking services that will benefit the business and, frequently, the granting of a loan up to that bankers' lending limits.

By using a loan package, all information required by the loan application is presented but it is presented in a manner favorable to the new business. By using a loan package, the Midnight Engineer can also attempt to explain any potentially damaging facts or figures while, at the same time, educating the banker about the uniqueness of the operation.

So that the loan package is not wasted, it can also be used, often best used, in fact, to attract investors, venture-capitalists and even others who wish to invest in, become involved with or sell to the new business venture. That's right, suppliers often extend credit in order to win business, particularly future business, from their prospects.

Other financing sources include: Banks, for instance, specialize in providing services such as checking accounts, payroll services and credit checks along with short-term loans. Finance companies specialize in intermediate term loans in moderate amounts. Government agencies and related organizations usually limit themselves to attracting ventures that will guarantee employment or require capital for plants and equipment. Underwriters specialize in selling stock, (another form of raising money for the small business operation). Family members and friends are also a source of participating investors or investing partners. Venture capital investment is generally limited to high technology startups.

At the same time that the essentials are being worked out, less tangible features shouldn't be ignored. In order to be considered as a tax business, the IRS requires every Midnight Engineer to actually hold themselves out to be in business. The business plan which contains a section on promoting the business activity, its products or services, will both satisfy the IRS and take the Midnight Engineer a step closer to success.

The IRS looks favorably on any engineer or entrepreneur who quits his or her job to depend upon the activity for his or her livelihood. Obviously, this is not realistic for many of us. But a good substitute is the amount of time devoted to the activity — or the time devoted by employees or those experts. Anyone who has enjoyed success in another field is viewed by the IRS as also having a good chance to succeed in the present endeavor, success that can be enhanced by a good business plan.

Common sense is the one service a Midnight Engineer can't find or buy. And yet, it is something that is essential to the success of any business. If, for instance, a new business cannot afford an employee, a new piece of equipment or an expensive ad campaign, it shouldn't waste money it doesn't have.

The IRS looks favorably on any engineer or entrepreneur who quits his or her job to depend upon the activity for his or her livelihood.

Profits in relation to the amount of time and money invested in the operation are what the IRS wants to see. And that old two-out-of-five profit years (2 out of 7 for horse-related activities) test means only that the burden of proving the existence of a profit motive is lifted from the Midnight Engineer's shoulders. With profits, it is up to the IRS to try and prove the activity is a hobby.

That business plan to establish a goal and chart the proper path to it, backed up with the proper records and books to keep the Midnight Engineer on course and perhaps indicate another path or a shortcut, increases the chances of success — and satisfies the IRS. And, if the IRS is satisfied that a business exists, the ultimate reward is a helping hand from Uncle Sam in the form of a reduced tax bill. But it takes common sense.

ME

Mark E. Battersby may be reached at POB 527, Ardmore, PA 19003, 215-789-2480

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THE GOAL and PROFIT

by Bruce Boyes

Reviewing Eliyahu Goldratt's book ***The Goal*** in ME May/June 1994 and my talk at ENTCON '94 have sparked some interesting controversy. Goldratt states in his book that making money must be the major Goal of a manufacturing company. In his stimulating Edge of Chaos column last issue, Bruce Eckel said he had to disagree with the notion that the goal of any business endeavor is to make money. Several ENTCON participants made comments to me such as "the most important thing to me isn't making money."

Apparently, the whole subject of money and profit in business touches a nerve in some Midnight Engineers. Since ENTCON, I've made some interesting personal discoveries about my beliefs and perceptions in the area of finances. I'll share mine and perhaps some of you will share yours. FAX, BBS or write (details are at the end of this article), and I'll collect and tabulate responses for a possible future article. When you respond, please tell me if it's OK to mention your name or if you prefer anonymity.

Profit Perceptions

Until a few weeks ago, if you'd asked me if I wanted Systronix to be profitable I'd have answered "What a silly question — of course!" But recently I was asked to write down all the associations which came to mind at the mention of the word "money." You might try this yourself. Don't think about it or try to come up with "right" answers, take just two minutes and free associate. Write down whatever comes to mind. Include any phrases you've heard — "a penny saved is a penny earned," for example.

In my case, I was startled to see so many negative associations. I wrote down words and thoughts such as greed, selfishness, dishonesty, and fear of losing it. Phrases which came to mind included "Live within your means," "The love of money is the root of all evil," and "It is harder for a rich man to enter the kingdom of heaven than for a camel to pass through the eye of a needle." Whew! These were not the kind of associations which would help me realize financial abundance! Anthony Robbins — you've seen him on those latenight infomercials — calls these negative associations "wealth wounds." From where did they come?

Clearly I had some negative programming around the issue of personal financial success. In the religious environment in

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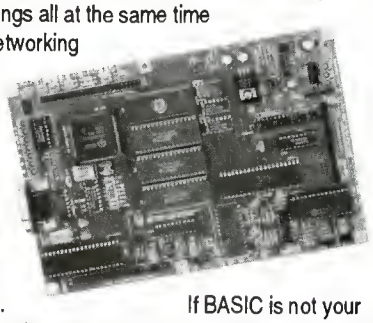

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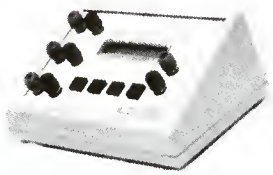

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which I was raised, the Biblical quotation "the love of money is the root of all evil" often got truncated to "money is the root of all evil." We discussed personal financial matters in hushed tones, and only when absolutely necessary. In the movies and on TV, rich people are often buffoons or are depicted as lazy and dishonest, while the honorable, hardworking frontier settlers struggle to make ends meet.

Current research on the human brain suggests that as much as 90% of our brain's processing is not brought into our conscious awareness. We are only aware of a small percentage of our thoughts and actions. I began to wonder to what extent this unconscious negative programming was affecting my ability to run a profitable company. I've read a number of business case studies in which brilliant inventors were not able to succeed financially.

Business professors and consultants have told me that companies started by non-business people often have inherent financial "speed bumps." The first occurs at $250K-$500K of gross annual revenue, the second at sales of $1M to $3M. Many growing companies seem to self-destruct at one of these levels. I'd like to know why. Usually the blame is laid on the founder for lacking proper management skills.

Perhaps people who are creative and inventive also have a high likelihood of being money averse. Some people seem to sabotage their own efforts to achieve financial abundance. The stereotypical starving artist, penniless inventor, or professional athlete come to mind as examples.

Limiting Beliefs

If you have negative feelings about exercise, what's the likelihood that you will be healthy and physically fit? Apparently, many would-be entrepreneurs have money hang-ups, since overcoming these hang-ups is a component of many entrepreneurial educational courses. Negative feelings about money will undermine your efforts to build a healthy, profitable business. I'm curious how many other business owners have discovered similar limiting beliefs and are working to change them?

Personal vs Business Goals

Most of us probably agree that making money should not be your main personal goal. Donald Trump is not my hero! We have other healthy priorities such as expressing our creativity and inventiveness, spending time with friends and family, and so on. But business goals can be different from personal goals. In all the companies in which I worked before striking out on my own, there was a cultural clash between the Engineers and the "Bean Counters."

The bean counters were derided by the engineers for only being concerned with profit, and having no sense of aesthetics or creativity. But who signed our paychecks? The bean counters. Someone had to manage the company while we worked in the labs. Looking back, I now feel that we overvalued the creation of new products and undervalued the sale and marketing part of the business.

Profit From Another's Limiting Beliefs

I wonder if historically there has been a hidden agenda in getting people to believe that money is something nasty. If a few people (who happen to be employers interested in making lots of profit) can convince many other people that money is evil, the few can often get the many to work for low pay. The few can then profit tremendously from the many's abhorrence of material gain! Clearly this belief doesn't serve the many as well as it serves the few.

In the case of several companies here in Salt Lake City, small management teams are making very good money while a large group of employees make not much over minimum wage. In several cases, the companies are serving non-profit, politically correct, socially responsible markets. The employees don't share the wealth. Rather than feeling disgruntled, several I've talked to actually feel noble for contributing to a worthy cause and don't seem to mind the low wages.

In another case, a local company with questionable business ethics is simultaneously involved in highly visible philanthropic community programs. It's as if they are trying to assuage the guilt they feel over their day to day business practices.

I believe that money is no more inherently good or bad than any other abusable commodity: food, alcohol, prescription or non-prescription drugs, political power, spray paint, hammers, automobiles, guns, etc. You can apply almost anything in life to enhance or diminish the quality of your environment. It would be silly to ban spray paint and hammers in an attempt to stop vandalism. It's just as silly to consider money and profit evil. In our capitalistic society both are necessary components of a healthy business.

Manufacturing vs Other Organizations

Some of the subtleties in *The Goal* deserve elaboration. Goldratt's book focuses on manufacturing operations. A manufacturing or production operation is defined by Goldratt as an organization which turns inventory into throughput with some operational expense. Throughput is the rate at which the system generates revenue through sales. Inventory is all the money the organization has invested in purchasing things which it intends to sell. Operational expense is all the money the organization spends in order to turn inventory into throughput.

The Goal of a manufacturing operation is to make money. This doesn't mean that the primary personal goal of the employees must be to make money. But when the employees are at work, creating profit had better be their goal or they won't have their manufacturing jobs for long.

These categories don't apply to many non-manufacturing and service organizations. There are plenty of examples of non-manufacturing operations. Health care facilities, schools, public transportation systems, fire and police departments, research and design labs, military organizations and so forth can provide valuable services but often do not and should not be profit-motivated. A library doesn't have inventory, gener-

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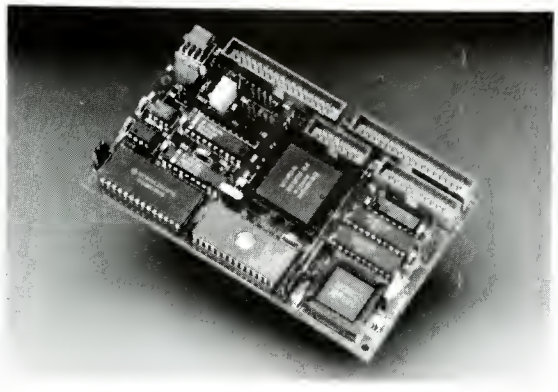

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ate throughput, nor have operational expense in this specific manufacturing sense.

Our society has special provisions to support non-profit entities. We fund schools, the military, and public transportation systems with taxes. Health care facilities often are funded by taxes and/or philanthropic organizations, though this is changing dramatically.

Motivation

A number of studies have shown that engineers are generally more motivated by creativity and curiosity than financial gain. There is nothing inherently wrong with this. We all enjoy stimulating and creative work. But I can't pay mortgage and utility bills with creativity and curiosity! Maybe at some future point we can be like the crew of the Starship Enterprise. They never worry about money or have any materialistic aspirations. In our society, unless you inherent your wealth, you've got to produce positive cash flow somewhere.

Just out of college, I worked for IBM in upstate New York, doing new product development. I put in my hours and my paycheck arrived from somewhere in the bowels of the corporate organism. I didn't have to consider issues such as the cost of sales, cost of goods, return on investment, or whether the machines I was creating would eventually pay for someone's salary. We never ran out of money. Someone else figured all the financial stuff out. We had budgets and were trying to create marketable products, of course, but these budget and marketing decisions were not mine. Nothing in my engineering education prepared me to make such decisions.

Surprise! As a business owner, I must make marketing and financial decisions. I have to become a parttime (shudder) bean counter! Those are my beans, and they pay my salary. Unlike the IBM of the past, my company can easily run out of money. What a switch from typical engineering responsibilities! No wonder so many engineer-run companies have a hard time financially.

Profit is Needed Somewhere

Is there any research and design lab which is not supported by a profitable manufacturing operation? If you follow the food chain far enough, everyone derives their income from profitable production. Even tax-funded research groups or welfare recipients get their income from taxes on profitable corporations. Individuals pay taxes on wages paid directly or indirectly by... you guessed it. Even a barter economy trades on goods which have market demand. The goods — tanned hides, food, shoes, or whatever — are the output of a production system.

Even if you make your living performing design for hire, your current designs must be produced and sold by someone. Sometimes this happens so far downstream from you that you can't see it, but it must happen. If you sell patent rights for your personal income, they are only of value to the purchaser if they eventually contribute in some way to throughput — if they

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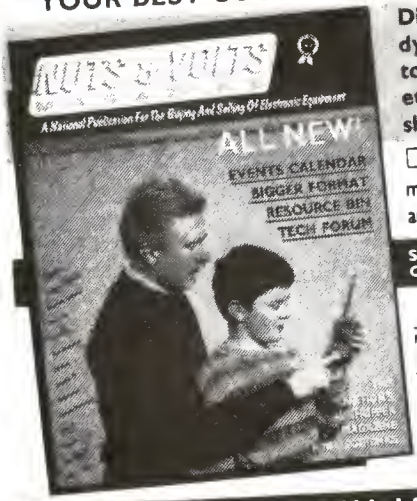

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Startups with venture funding get their capital from investors. Dig deep enough and you'll find a place at which the investors got their money for the startup from a previous successful production operation. In our society, you can't play by the rules and get something for nothing for very long.

Venture-funded startups sometimes confuse their investor's funds with sales income. They live high on the hog (fancy offices and company cars) when they have no throughput being sold to customers. Having money in the bank from debt or equity financing is not the same as profit, but it can feel deceptively similar. This situation tends to be self-correcting and seldom lasts long.

The electronic assembly subcontractor that I use, EMA, is a family run business. EMA operates lean and mean with no fancy offices or perks. They buy assembly equipment only when absolutely necessary, and used when possible. But their entire facility is carpeted wall to wall with premium grade anti-static carpeting. Every table surface is covered with expensive anti-static matting. Ironically, EMA purchased these materials from a larger, now defunct, assembly firm. The large firm bought the latest and greatest equipment and outfitted a world-class facility. Management drew six-figure salaries, without any significant customer base. Eventually the large firm's investors got tired of subsidizing the operation. EMA purchased their carpet and mats for pennies on the dollar.

A Question of Balance

The challenge I see for the entrepreneurial engineer such as myself is creating a balance between satisfying, creative work and profitable work. It's more fun for me to design a new embedded system than it is to manage the monthly production of our existing products. But production and sales efforts, not research, bring money in the door today. Throughput from the manufacturing side of Systronix funds further research and development.

Customers give me the opportunity to enjoy satisfying new challenges only if the Systronix manufacturing operation creates throughput for them. Stated another way, people give me the opportunity to create something new if I deliver something currently of value. This seems like a fair deal to me!

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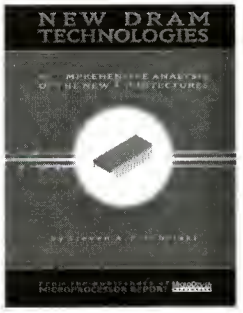

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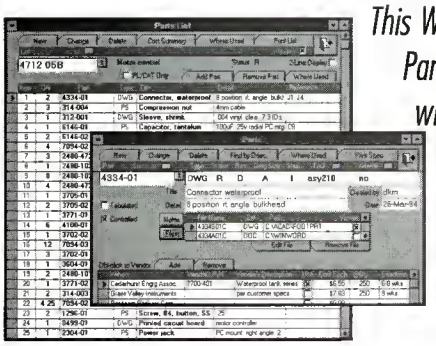

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Reader Service Number 5

Patents — A Second Opinion

by Rick Martin

Patent attorneys often see people who've spent the larger part of their careers dealing with computers and have developed something they think might make them money in the computer industry. These entrepreneurs come to me with a supply of rumors. The two most common of preconceptions are: "Shucks, anyone can get a patent" and "A patent will make me money." As is usually true of rumors, neither of these is entirely correct, yet each contains a little truth.

It's true that just about anyone can get a patent. If you're sitting on a little computer-related invention you'd like to patent and it's truly a new idea or new technology — and non-obvious — getting a patent shouldn't be difficult. Most persistent and hard-working developers can patent computer hardware or computer aids themselves or they could have any experienced patent attorney write a patent application. Over 100,000 US patents are issued yearly as proof that a patent is not that difficult to get. The trick is getting it to hold up in court. (More about that later.)

Know your target. When you shoot at everyone, you hit no one.

It isn't true that a patent on your work will automatically bring you sales and wealth? A patent isn't a magic bullet. Making money from your patented hardware or aid involves much more than having a great idea and a patent on that great idea — That accounts for the scarcity of millionaire computer techies.

Turning a patent into money requires a recognition of — and the willingness to follow — proven business-building principles. I tell clients there are five basic steps to taking a new development from the idea stage to the money stage. Note that patent application is only one part of the fourth step.

1. Identify a Small Market Niche

Know your target. When you shoot at everyone, you hit no one. When you have an identifiable target, it's easier to aim and hit something. Finding your niche takes the mulling and milling out of the marketing procedure.

2. Find a Rich Uncle

Or his equivalent, if you don't have deep pockets yourself. The reasons are obvious, but many developers are convinced they can operate on a shoestring. I give them the get-real list you see below. If you really think the computer industry can't live without your idea and you're serious about making money from it, you need big bucks to:

. build prototypes and conduct beta tests
. build an inventory
. buy product liability insurance -advertise
. train distributors
. attend trade shows
. pay the experts (See
. exist for at least a one year startup phase

3. Determine How Your Product is Different

Who are your direct competitors? Who are your indirect competitors, those who offer a product which will accomplish the same thing but may not be called the same thing? How will you distinguish your product from theirs? Yours must be better in some way — faster, cheaper, smarter, smaller, larger, etc. — than your competitors' products.

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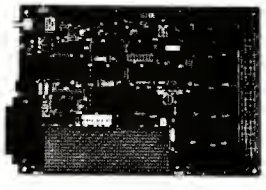

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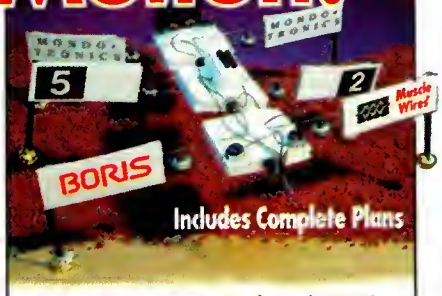

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You need subcontractors who know what they're doing. Don't try to learn their businesses; you have enough to do as the developer/general contractor. You need:

. marketing coordinator
. advertising/graphics agency
. packager
. attorneys (corporate attorney to create an entity, tax attorney and CPA to keep the government in check, securities attorney to raise money, and patent attorney to file patents, copyrights, and trademarks).
. bookkeeper (to keep score)

5. Wait

It usually takes one to three years to see a return on your investment. The annals of failed businesses are filled with inventors and developers who were certain they would see a serious payback in only months and were depending on their hunch to make the house payment and buy the kids' Nikes and McDonald's burgers. They were wrong. If you don't have time to wait for ROI, don't quit your day job!

Here's a true story illustrating the importance of these five steps and how unimportant a patent can sometimes be. While this story is from another industry, the principles hold true in the computer industry as well.

A client invented a simple metal disc to be installed next to the brakes on four-wheel-drive vehicles. It was to keep dust off tires, so he called it Kleen Wheels. The PTO said his invention was too simple and denied the patent. He trademarked the name and manufactured anyway.

Through a direct mail campaign to 20,000 auto dealers, he made hundreds of thousands of dollars in sales. As he developed more styles, he developed more hole combinations. At that point, we filed for a patent on the hole patterns of his discs and received it. (Yes, he has a patent on sets of holes.) His product made money, not because of a patent, trademark, or copyright, but because he followed all five steps.

Now that I've debunked the myth of the magic-bullet patent, I'd like to give the patent its proper credit.

As I said earlier, any fool can eventually grind a patent out of the PTO, but will it hold up in court? Probably not. There are 24 defenses — 24 ways to destroy a patent — in patent law. It usually takes seven years of college and five years of courtroom experience to understand and master these mechanisms of legal destruction. Few developers have time to study patent law and master these 24 defenses.

When an entrepreneur patents a product and tries to license it to the big boys, his patent is scrutinized by the big-boys' attorneys, most of whom have at least 20 years of experience. If there's a way to destroy a patent, they find it. A do-it-your-selfer's patent is easy pickings. All his hard work is lost, and his patent is useless because he saved a few dollars in legal services.

Is a patent a magic bullet? Nope, and thinking so overestimates a patent's ability to make you rich. Rigorously implement the other business steps I've listed if you want your development to make money.

Is a patent worthy of being called a bullet? You bet. Never underestimate the importance of your patent's ability to hold up in court. Get an experienced patent attorney who can write a patent application that will withstand the court's magnifying-glass inspection. A patent is the only legal monopoly on technology in our free society. The more valuable the technology of your invention, the more valuable your patent. (For a low-tech invention, a patent usually serves as insurance against well-heeled copycats who have something to lose in litigation.)

Ready to make serious money on your computer development? Get a patent. But remember that although a well-done patent is definitely a bullet you want in your six-shooter, it isn't a magic bullet.

ME

Rick Martin specializes in helping people who have intellectual properties they want to protect.Interested inventors may call 303-651-2177 for the free handouts: **Early Stage Financing** *and* **The Difference Between Valuing and Pricing Products.**

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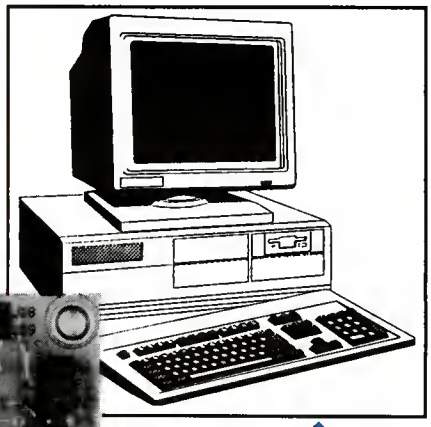

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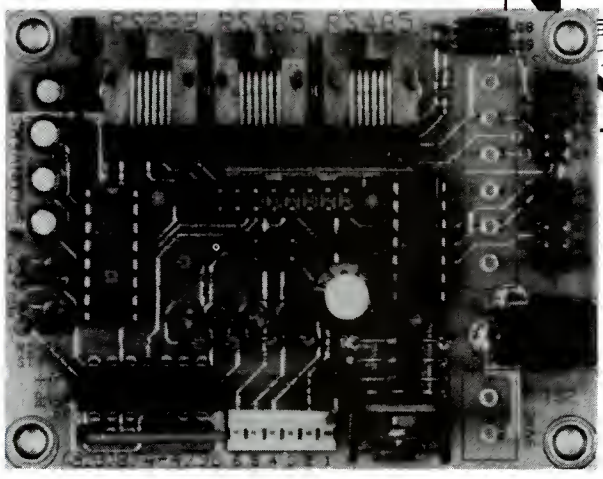

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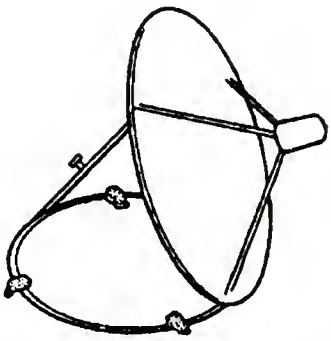

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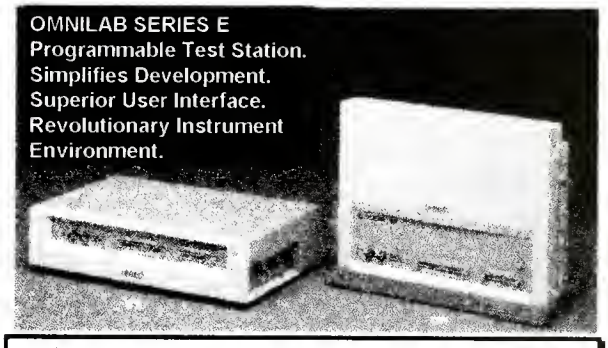

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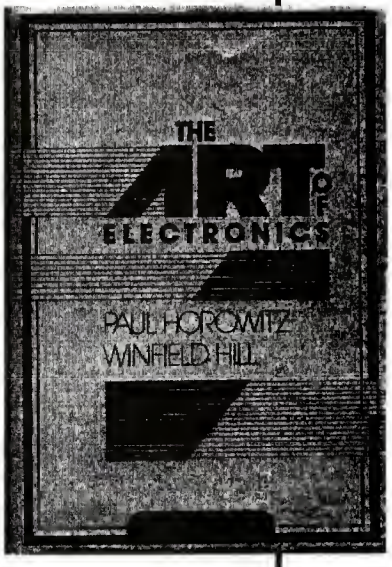
The Bookshelf

***The Art of Electronics*, Second Edition by Paul Horowitz and Winfield Hill 1989, Cambridge University Press, ISBN 0-521-37095-7 (Hardcover, 1,125 pages, about $50)**

Reviewed by Dale Grover

Among my technical friends *The Art of Electronics* is just "Horowitz and Hill," its pages a comfortable guide and friend in matters electronic for both the learned and novice among us. Hands down, this is the single most useful electronics text you can own, a respected and oft-quoted book of unusual clarity in the field.

Even if your explanation of how your PC or stereo works involves magic and/or tiny people, a modicum of intelligence and this book should give you the ability to engineer electronic solutions that are correct, robust, and efficient. This feat requires at least two major elements--subject matter in sufficient depth, and a successful strategy for conveying this information. My shelves are filled with excellent examples of how to do neither (at length), or at best just one. Here is a book with both elements, and hence a book that serves both as a guide to learning and a reference for the more advanced. On the subject matter and its depth I will comment shortly, but to most non-EEs the book's most outstanding quality is its excellent presentation of what too often is obscured in mathematical arcanum.



The book purports to teach electronic design skills for folks who need to do it in real life (scientists, researchers, even—dare we say—electrical engineers). Horowitz and Hill succeed where so many have failed (miserably, may I add with emphasis), by treating the reader as intelligent and interested in learning how to do real electronics. The fact that the general solution for a first-order differential equation is not on the top of one's head does not mean that good electronic design can't be learned--an important, useful subset of electronics can be mastered that is sufficient for most if not all non-exotic electronic design without a masters degree in mathematics.

Horowitz and Hill's approach is to appeal first to the reader's intuition and establish a simple model, one which can be embellished if necessary later (usually to account for more subtle behavior), but provides a solid basis for robust design. Because these models are developed incrementally for devices such as transistors (I am thinking especially of bipolar junction transistors- -common, cheap,

The Bookshelf

and a device I've always had problems understanding), these models do not overwhelm the reader with details, but on the other hand aren't so simplistic that they must be abandoned to incorporate the inevitable refinements that more exacting usage may require.

How difficult is this for the reader? It is probably not so much an issue that the subject is made "easy," but that the subject matter is presented so accessibly that it pulls the reader along, rewarding the effort made with insights and understanding that are immediately applicable in useful electronics. The connection is always made to the real-world--the applications, tradeoffs, and devices that actually exist--often in useful detail (charts of op-amps, for example), but never to the detriment of the basic theory. Theory is used to create a framework; actual practice is then located within this framework.

Now, having access to some of the tools and materials of the trade will be very useful (the laboratory manual to accompany the book looks like a good investment), but there's no skimping on the illustrations, and plenty of example circuits illustrate both good and bad design. (These "bad" circuits are sometime riotously so, though your non-technical friends may look at you rather oddly when they see you laughing at an electronics text.) The text is liberally peppered by a number of tables showing real-world devices, often noting popular, low-cost, or unusual types.

For the person without electronic design knowledge, it is hard to imagine the subject presented with more clarity or effectiveness.

At some 1,125 pages, *The Art of Electronics* covers an appreciable range of topics (see sidebar)—from volts and amps to high-speed analog design, from resistors and capacitors to microprocessor-based systems. From my own perspective and from what I've read of other people's impressions, the breadth and depth of coverage is extraordinary. I've seen technical articles from major semiconductor houses reference H & H on rather subtle device behavior; at the same time, there's a section on the ubiquitous 555 timer chip (the duct tape of integrated circuits—frequently used, often abused).

H & H may not have the answer to everything electronic, but I continually am surprised to find some topic covered--in detail!—that I wasn't expecting. A rather mundane example is RS-232 serial communications ("RS-232 standard"—an oxymoron if ever there was one!). On some level this is an expected topic as far as implementing, but anyone in the real world can tell you equally important is just connecting two pieces of lab equipment. So, sure enough, the topic of implementation is covered in proper and gory detail, but the high-level overview of data communications drops into the nitty-gritty of RS-232 "cabling," including a quick "How to become an RS-232 genius." Never fear, though, for on the next page, a chart comparing RS-232, RS-423A, and RS-485 in every aspect from data rate to output current limit.

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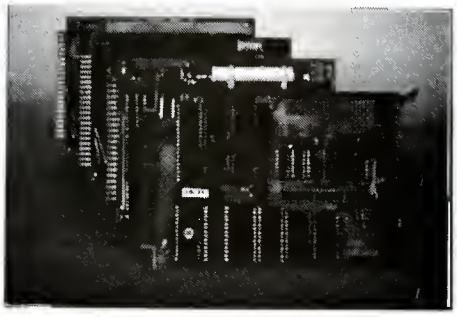

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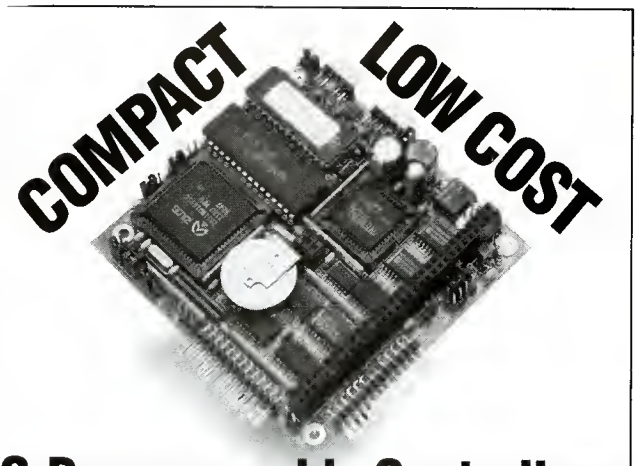

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The Bookshelf

Any attempt of this scope must surely have its weak spots, and the experienced practitioner will not doubt find some specialty slighted, some technique overlooked. At the same time, one may question if the subjects of interest to the writers coincide with the reader's needs—after all, most of us will spend many happy years without having to deal with millivolt or high frequency signals. Happily, Horowitz and Hill generally are more than thorough with the subjects they address, and willing to point out those areas they are unable to cover (e.g., DSP and (alas?) SPICE). As to the relevance of the subjects, it is often the case that the extremes of design (high frequency, low noise, etc.) emphasize aspects of design that are present in more run-of-the-mill design as secondary design considerations. This kind of information can only help.

One of the most welcome additions to the second edition is a section on low power design, and it is very well done, joining other topics like high frequency and low noise that can be real design headaches without some helpful guidance. However, it is at these extremes, and in components for low power design particularly, that the book shows its 1989 perspective. This is far from fatal since in practice you'd scan through the Maxim databooks for more recent regulators, say, rather than depend on the book's charts exclusively. But I know a lot of people anxious for another edition (and in fact, have heard 2 separate rumors of a new edition already being out, not true); I myself follow the trade magazines religiously and would enjoy the perspective H & H give to the bewildering array of new devices.

In writing this review I have felt more than once like I was pointing out the water spots on fine china. I know of no comparable book to *The Art of Electronics*. You could buy it for the intelligent high school student, or for the experienced designer. The emphasis on robust, quality design will definitely make this book an asset to anyone involved in electronic design. Go out and buy it already.

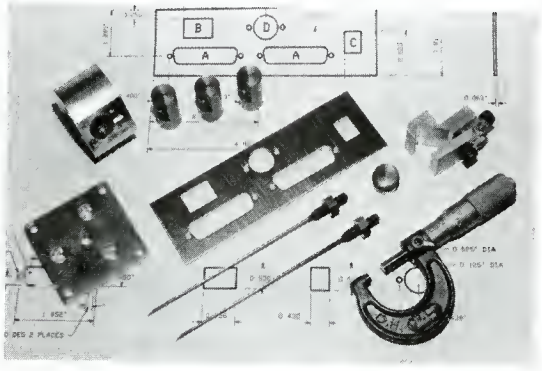
Contents:

Foundations; Transistors; Field-Effect Transistors; Feedback and Op-Amps; Active Filters and Oscillators; Voltage Regulators and Power Circuits; Precision Circuits and Low-Noise Techniques; Digital Electronics; Digital/Analog Interfacing; Microcomputers; Microprocessors; Electronic Construction Techniques; High-Frequency and High-Speed Techniques; Low-Power Design Measurements and Signal Processing.

Among the appendixes are sections on using an oscilloscope, how to draw a good schematic, electronics magazines and journals, IC prefixes, and some sample data sheets.

Dale Grover is a partner at Red Cedar Electronics where he is involved in the research and development of devices for non-speaking people. He can be reached at P.O. Box 158, Okemos, MI 48805.)

Metal Work



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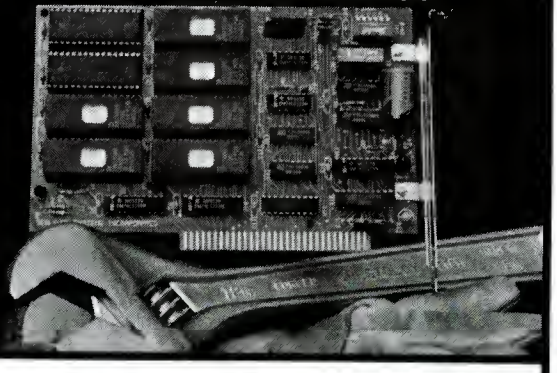

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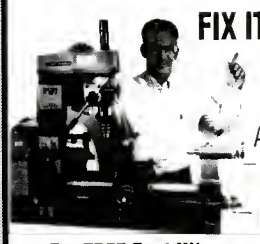

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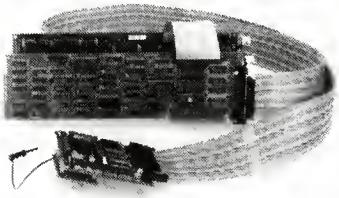

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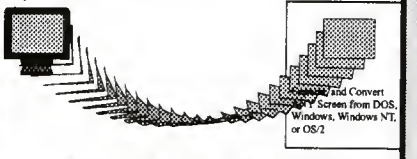

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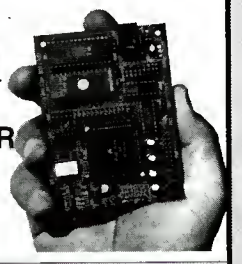

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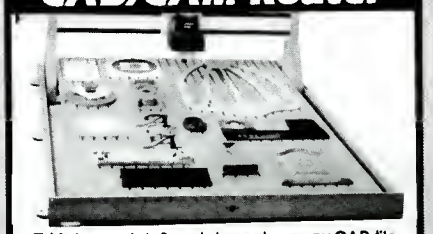

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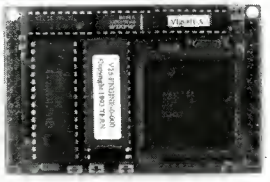

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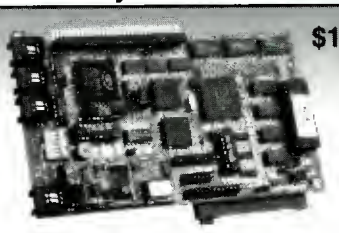

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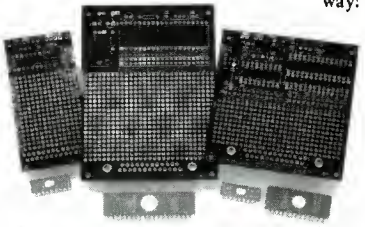

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When to Patent

by Don Lancaster

For most of you Midnight Engineers and other small scale startups most of the time, any involvement whatsoever with the patent system is nearly certain to result in a net loss of time, energy, money, and sanity.

Two major reasons patents are usually an irrelevant and a totally unneeded sideshow: The outrageously dead wrong popular mythology that today surrounds patents and patenting. And the ripoffs and outright scams which are *certain* any time an "inventor" context appears.

But – *extremely rarely* – I do get a helpline call from some Midnight Engineer who just possibly *might* want to look further into patents. One involved a new microscope. A second was a unique tunable laser.

It seems to me that there are some fundamental questions you should ask yourself before you so much as *think* about the word "patent"...

Are you an industry insider?

Do you aggressively subscribe to most of the industry trade journals? Attend the major trade conferences? Talk to the real experts? Do you *thoroughly* understand all of the theoretical fundamentals behind the field? Are you aware of the political, legal, distribution, and marketing realities of the target industry? Do you know and understand the motives and desires of the industry's customers?

If not, the gotchas are near certain to git ya. If you are not an insider, the odds are overwhelming that you'll be working on some totally unmarketable non-solution to a non-problem. One with near-zero chances for success.

And one largely pointless to patent.

Is the concept truly and genuinely new?

To be patentable, a concept must be *new*. It must not be obvious to *any* practitioner in the field. There must be no prior art *anywhere* in the world. Even in ultra-obscure and limited distribution documents. All prior art *must* be fully disclosed. Failure to disclose trashes the patent.

Because so many people are thinking about so many things in so many places, *synchronicity* virtually guarantees that your idea or concept is neither new nor unique. In fact, your idea almost certainly has been plowed over decades ago. To the point where *there is not one patent in one thousand that cannot be busted by a diligent enough search for prior art in obscure enough places.*

The only exceptions here are if you have a totally unique lifestyle, tools, and mindset. And have made the total personal commitment to being well *beyond* the bleeding edge of the technology in your target field.

Have you done your homework?

At least 95 percent of your search for prior art should take place *outside* of the patent system. For the real world is where things actually get used by real people.

Have you *thoroughly* reviewed the trade journals, data books, industry shows, scholarly pubs, and manufacturer's catalogs? One recent helpline caller was trying to patent a widely advertised envelope design that was a 25 year old off-the-shelf item from one of the highest profile suppliers.

My long term favorite key research tools include the *Ulrich's Periodicals Dictionary* that lists some 150,000 trade journals. And the *Encyclopedia of Associations* that names just about every industry trade group.

But these days, your real research biggies are the online resources. Especially *Dialog* and the *Internet*. To the point where I very strongly feel that *it is virtually impossible to successfully patent something today without an extremely aggressive personal use of the on-line resources.*

Mindsets such as "But I live in a remote area", or "There is nothing in my local library" are *absolutely guaranteed* to cause your patent to fail.

Have you done an economic analysis?

I have gotten dozens of helpline calls from potential patentees who have given no thought whatsoever to the needs and desires of the ultimate customers.

A surprisingly wide variety of products can be grossly classified as "toys" or "tools".

If it's a toy, how much time and effort is the end user willing to spend to derive pleasure from the toy? For how long? How well does that time and effort compare to the rewards for selecting a different toy instead?

If it's a tool, how long does it take the tool to pay for itself? The key issue here is finding the *time to economic breakeven.* Many tools will *never* pay for themselves. This happens if the initial cost and the time value of the money needed to buy them exceeds the net return in income or productivity the tool generates.

In one sad helpline case, a potential patentee had a product that would *at best* increase the direct mail response of non-profit organizations by a few hundredths of one percent. While creating high avoidable costs in the process. In another, a low temperature heat engine was so utterly inefficient that the longer you ran it, the more it cost.

Always place yourself in your customers shoes. And ask what the benefits are. Failing to do an economic analysis is sheer lunacy.

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If You Must Patent It

Will your net sales exceed $12,000,000.00?

What percentage of your profits are you willing to spend subsidizing the US patent system? Four percent? Forty percent? For some reason that I don't fully grasp, most patentees insist on spending between 400 and 4000 percent of their profits on patent office and attorney subsidies.

Sometimes much more.

Remember that a patent is *only* the right to sue someone. The cost of getting a patent is utterly trivial compared to your long term enforcement costs.

Let us assume you can get a patent and successfully defend it through a court challenge and an appeal or two for less than $240,000. This figure is much *less* than the norm. Let's also assume you are willing to blow 25% of your profits on the patent system. Your profits would then have to be $960,000. Assume further that your business has a net profit margin of 8 percent. A figure much *higher* than most industry averages. Your net sales would then have to exceed $12,000.000.00 for a patent to just barely meet your subsidy goals.

To me, it makes *no economic sense whatsoever* to try and patent a million dollar idea.

Does the field welcome innovation?

Certain fields *severely* penalize any new products from Midnight Engineers or any unknown small scale startups. While making sure that they are virtually *certain* to be an economic failure. *If there are possibly insurmountable marketing hurdles in the target field, there is not much point in worrying about patents.*

At least until such time as you are reasonably sure the hurdles can be successfully cleared.

Some ferinstances: Products that are legislated to death (cancer cures; cryptography). Highly regulated industries (pollution controls; industrial safety). Overpriced solutions for ill-defined markets (handicapped).

Designs that demand a new infrastructure (electric cars). Or threaten an old infrastructure (electric cars again).

Unpatentable pseudoscience areas that previous scams have trashed (cold fusion; perpetual motion). Fields that have been eaten for breakfast by lawyers (private aviation; sports gear). Or ventures where some elite oligopoly calls all the shots (long distance telephony).

Two of the most restrictive markets are autos and private aviation. Primary automotive is a closed club. If you, your father, and your grandfather are not all SAE members, you can forget it. Aftermarket automotive has such gotchas as the EPA making it is a felony to *reduce* emissions on a car when you modify an emission control device.

The private aviation market is simply not there. A glance at any rural airport verifies this. As does the fact that the leading business jet sold a mere *fourteen* copies last year. Your best bet is to take your quarter size working model and sell it to the wide open and highly lucrative R/C model field instead. Go where you're wanted.

Will only a few covet your design?

Patents are enforceable only where and when you're able to clearly identify a few major violators. Each offender usually has to be dealt with individually.

Suppose you patent something and nobody bothers to

challenge it in any manner. Which is the fate of the vast majority of patent submissions. Clearly your idea was not worth patenting in the first place.

On the other hand, suppose instead *everybody* covets your patent. There is *still* no way you can enforce it.

One way this happens is when the idea is so obvious that nearly anyone can grab and use it. Such as new data sorting or compression methods. Another way is if the idea is so good and so important that the rest of the world flat out won't sit still for paying any royalties.

Two specific examples: RCA owns the iron-clad patent on making characters out of dots on a video screen. And Photocircuits now owns the rock-solid patent on printed circuits. As far as I know, neither company has been able to collect one red cent of royalties on these.

Because these ideas were *so good* that they simply *had* to be stolen.

Even the *threat* of a "too good" patent will immediately be met with an big bucks industry-wide response. Witness Compton's trying to patent Hypercard years after the fact. And, for the attempt, deservedly getting spanked and sent to bed without any supper.

An ideal example of an enforceable patent would be something like a down-hole oil recovery device. That, as an unavoidable side effect, left traces of a benign but exotic isotope in the refined gasoline. Only a few (the major oil companies) would be in a position to rip you off. And it would be clearly obvious who they were.

Is there Fortune 500 involvement?

These days, most patents are largely by, for, and of the megacorporations. Who have their legal departments to make patents solid and defendable. Plus the time and patience to pursue them. And are able to creatively bury the high hidden costs and negative vibes of patenting. A case can be made that the only real use patents serve today is as high tech trading cards for corporate power plays.

Larger investors also tend to favor patents. Under the delusion that they in some manner offer "protection" for their investment. In reality, most of the time, excessive patent involvment acts only as a long term cash drain.

Thus, the larger the company, the higher the *perceived* value of patent portfolios. But perception is not reality.

On the other hand, I have personally found that *any* involvement with Fortune 500 biggies will often do you in very badly. In totally unexpected ways. Much more on this in my *Incredible Secret Money Machine II.*

Will your product last five years?

Typically, it takes a year to two to get a patent. And you will need several more years after that to generate the cash flow to pay for your patent involvement. Some products do have rather long potential lifetimes.

Others do not.

Obviously, computers, electronics, and multimedia are fields where things are coming down so fast that most products are effectively obsoleted in six months. A time frame so tight that most competitors will elect to obsolete your product rather than copy it. *The surest way to render a patent moot is to improve it.*

It is not at all clear to me what role patents can serve in rapidly changing technologies.

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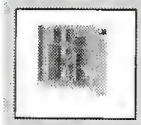
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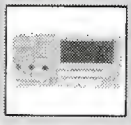
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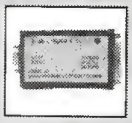
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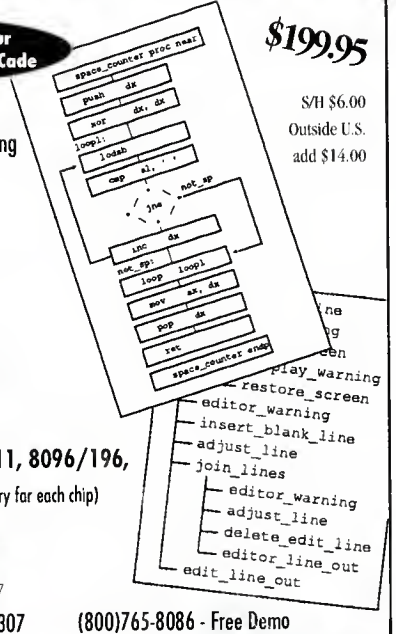

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If You Must Patent It

Is your product in beta test?

Any concept must follow a very steep *idea mortality curve*. As the idea moves from concept through evaluation, design, analysis, beta test, and final out-the-door products. Typically, 2499 out of 2500 concepts fail.

The further to the right you move along the curve, the *higher* your odds of success. And the *lower* the risk to the ultimate seller. Ideas themselves used to be worth a dime a dozen. These days, they are worth less than a dime a bale in 10 bale lots. Ideas gain value *only* as they progressively move along the mortality curve.

A near final step in the curve is the *Beta Test*, where outsiders are thoroughly evaluating your pre-production prototypes. A "patent without a model" is totally ludicrous (and wholly unmarketable), since you *must* have *many* models to get through this essential final hurdle.

Until you get out of Beta Test, you have absolutely zilch.

Is this what you really want?

A poet once spoke of a fork in the woods as the *path not taken*. When you pick the patent route, you largely commit yourself to a lifetime of courtrooms, bureaucratic hassles, stress, hidden agendas, attornies, and dispositions. And adversarial relationships that quickly convert your potential best customers into lifetime enemies devoted to doing you in. All at a monumental price in lost time and energy. With very low odds of a long term positive return.

When you pick the "tell all; hit it hard; then get out" non-patent route, you instead spend your time in your lab profitably developing, testing and improving new products instead. On a friendly and sharing basis with your best customers. Which path is more suitable for you?

For more information

Much more on tested and proven alternatives to patents and patenting does appear in my *Case Against Patents* two-book package. *Ulrich's* and that *Encyclopedia of Associations* should be available online or on the reference shelf of your nearby library. *Dialog* is offered via many commercial online services. Call them at (415) 858-2700 for a brochure. *GEnie* has a Dialog practice area free of surcharges. More info on the idea mortality curve in RISKDOWN.PS in the *GEnie* PSRT library.

I've also managed to wrangle a super special *GEnie* deal just for your *Midnight Engineering* readers. Ten free hours, no strings attached. Per the details below. ✦

Microcomputer pioneer and guru Don Lancaster is the author of 32 books and countless articles. Don maintains a no-charge technical helpline you'll find at (602) 428-4073, besides offering all his own books, reprints, and various services. Don has a free new catalog crammed full of his latest insider secrets waiting for you. The best calling times are 8-5 weekdays, Mountain Standard Time.

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RFPC—2

by William E. Gates

Amazing is a term I rarely use, but the last 30 days have truly been amazing. I have now obtained all the equipment required to complete the Rocky Ford Printing Company that will print this magazine. Like a printing company in kit form, it must now be assembled. In this issue, I want to cover the recent events that led to the acquisition of the final piece of the puzzle — a complete 100 foot long 150,000 lb 4-unit Web Printing Press.

Let's first remember that I am building what is probably the world's first full-scale personal printing plant — assembled by one person, run by one person, and existing for the sole purpose of printing one magazine for the benefit of one person. This is no longer some hypothetical notion. It is the real thing, driven by the economic fact that if I can pull together and run such a printing plant myself, I can cut the cost of producing this magazine by 80% or more.

A year ago, I defined the general requirements for success in this entrepreneurial adventure …

1) It had to be done with minimal capital so that I could leave the bank out of the equation. I needed to buy the building and the equipment at less than 10 cents on the dollar compared with the prices others were paying elsewhere. That meant that I needed to find special situations.

2) It had to be time-independent so I could work in my most efficient manner: sporadic periods of high intensity work interrupted repeatedly by the publishing of this magazine and the strong desire to spend time with my family. Anyone can be a workaholic. It takes far more presence of mind and discipline to find a balance that gives you a life outside of your work.

3) Intellectually, there had to be more to the project than just getting my hands dirty and saving some money. There had to be some engineering intrigue — opportunities to engineer unique solutions that would save time and money and reduce complexity with the possibility that these solutions could be marketed to other printing companies as a separate business.

…probably the world's first full-scale personal printing plant— assembled by one person, run by one person, and existing for the sole purpose of printing one magazine for the benefit of one person.

4) The result of building a plant to print just this magazine had to not only pay for itself in less than two years, but have the hidden (non-taxable) equity value of a full printing business that could be turned on in a very short period of time. Imagine, an entire printing plant, hot-staged and ready

to go online within a couple of months with annual revenues of several million dollars.

Item #1 above was accomplished by living in a small rural town is Southeastern Colorado where appropriate buildings were available and have remained unsold for nearly 10 years (called a buyer's market). Since there is twice the printing capacity in this country as is currently utilized, many printing

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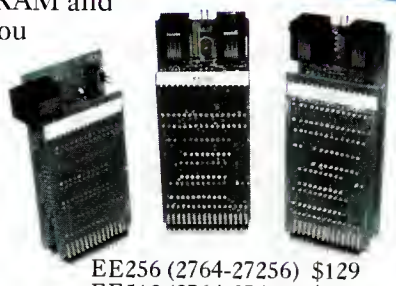

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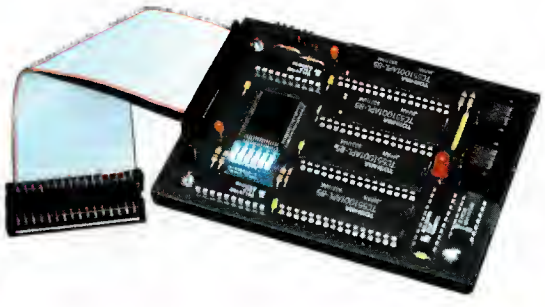

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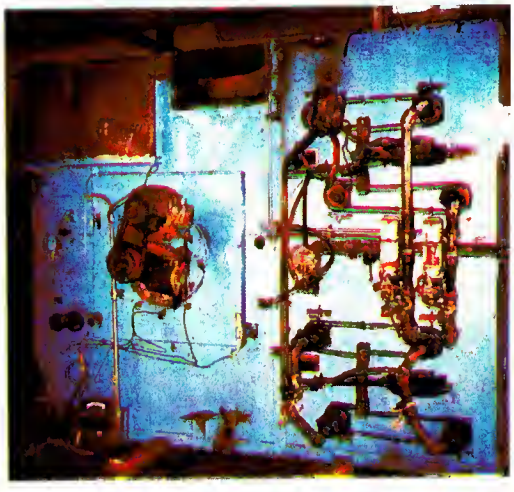
companies are going under. That makes for an abundance of used printing equipment and, again, a buyer's market. But, to meet requirement #4, I still needed special situations where the seller was desperate. Patience and the ability to strike quickly allowed me to acquire everything at scrap metal prices. In fact, just about everything I bought cost less than the cost of moving it.

The latest example of this stalking maneuver is...

The Miami Operation

Unlike *The Boston Operation* (Mar/Apr, May/Jun, and Jly/Aug '94 ME), this time I didn't even get my hands dirty. I must be getting better at this business of buying scrap metal. Perhaps this experience might be subtitled *The Miami Money Races*.



For nearly a year I'd been thinking that the huge 4-color Web Printing Press that efficiently prints a magazine like this would be a bit of a stretch. The asking price for these presses range from $100,000 to $500,000 and they are 20 - 30 years old. I had been talking with printing equipment brokers about wanting the one that was about ready for the parts heap. Maybe it was already out of service and someone just wanted it out of the way. They didn't really laugh at me, but since there wasn't much commission involved, they never called back.

Then, out of the blue on a Friday afternoon, came a fax from Miami. The fax outlined pretty much the press I had been looking for, already torn down — and they wanted it out of their warehouse right away. Asking price (FOB Miami) was a mere fraction of the $50,000 that I thought I would have to pay for a special situation. But, when I called them on Monday afternoon, they said that two other buyers had come forward through Joe, the owner/broker at the main office in Boston. In fact, both buyers said they were wiring money. Joe said that the first person that gave him real money could have the press. This was a travesty! But, he said that he had not, as of the close of business Monday, received any wire transfer confirmations.

Joe said that the first person that gave him real money could have the press.

I told Joe that I was FEDEXing him my check for the full amount and that I was buying this press sight-unseen without conditions. Joe said that I could have the press if my check got

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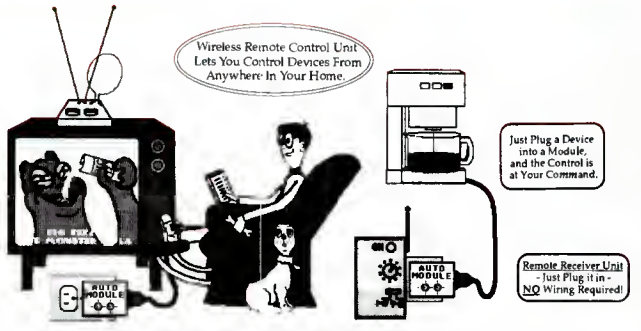
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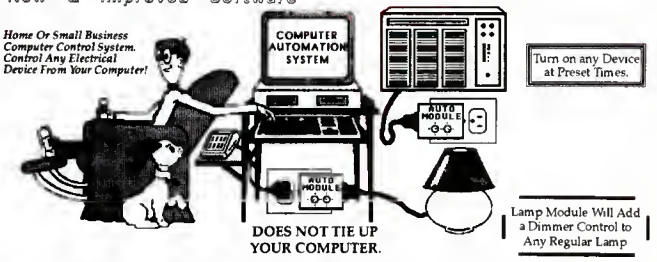
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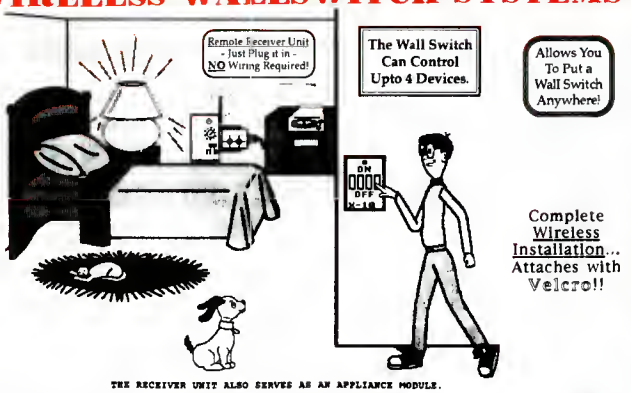
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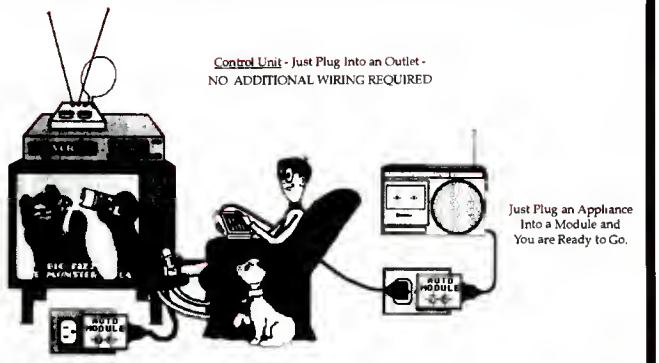
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AUTO MODULE

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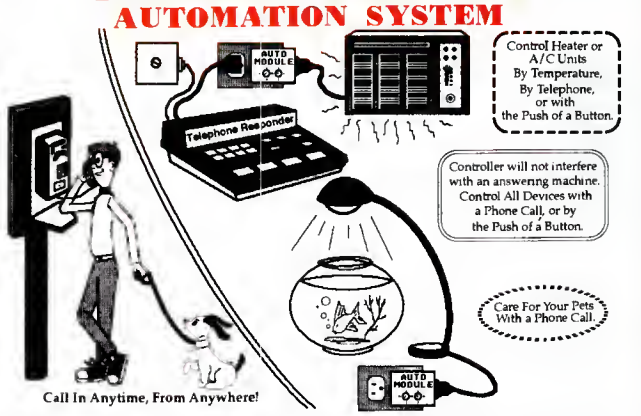
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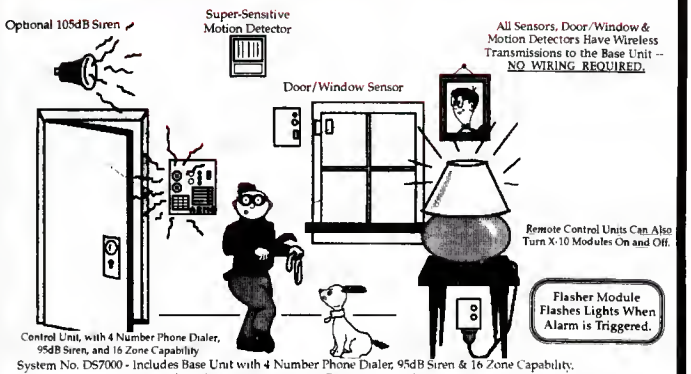
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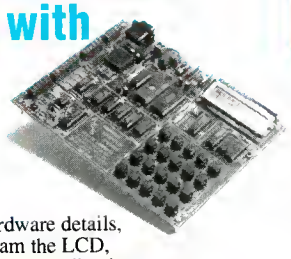

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Miami Money Races

there Tuesday morning before he received any bank wire confirmations.

FEDEX had already picked up in Rocky Ford, so I drove an hour to the FEDEX office in Pueblo, CO. On the way, I was getting a real funny feeling. Was Joe doing the old salesman two-step — they always say there's other buyers for the thing they want to sell to you — or was this, by my own definition, a chance of a lifetime. There was a two-hour window on Tuesday morning where I was vulnerable to the whims of some bank wire operator. This is what you call a compelling situation: How do I get to Miami tonight!

Pueblo, CO — 5:00pm Monday

After dropping off my FEDEX check going to Joe in Boston, I started feeling more than a little bit helpless about the situation. I phone Mary at Arapahoe Travel in Denver. "Bill, the last flight for Miami is leaving Denver right now and there's nothing else leaving until 7am on Tuesday." (Pueblo is two hours from Denver).

I explained to her that I must be in Miami by sunrise the next morning. Mary bangs on her keyboard, mutters something, bangs a little more and announces, "Ok, if you can get to Colorado Springs (one hour drive from Pueblo) and catch the 6:12pm United flight to Denver, I can get you to Miami by 6:30am." The reader will surely be suspicious of some sort of gotcha in this deal.

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Programmer's Journal

Partial Disassembly of a Virus

```
                mov     ax,2517h
                mov     dx,offset int_17h_entry
                int     21h             ; DOS Services  ah=function 25h
                                        ;  set intrpt vector al to ds:dx
                                        ; ('Halt when ? printed.')
                mov     dx,offset data_4
                mov     ah,9
                int     21h             ; DOS Services  ah=function 09h
                                        ;  display char string at ds:dx
                mov     dx,19h
                mov     ah,31h
                int     21h             ; DOS Services  eh=function 31h
                                        ;  terminate and stay resident
                                        ;  al=return code,dx=paragraphs
virustst        endp
;
;               External Entry Point
;
int_17h_entry   proc    far
                pushf                   ; Push flags
                cmp     al,3Fh          ; '?'
```

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Supports undocumented interrupts	yes
Describes all registers used for DOS interrupts	yes
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Menu driven	yes
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COM 80486 Device Drivers 80386 EXE 80286 Windows VxDs 80186 Binary Files 80x87 BIOS 8088 TSRs

Colorado Springs, CO — 5:57pm Monday

I pick up my tickets at the United counter. "No," I tell the ticket agent, "I don't have any luggage and no toothbrush." In fact, the only jacket I could find in the car was a slightly greasy, old ski jacket left over from *The Boston Operation.*

Denver, CO — 7:00pm Monday

Change planes to a United 757.

Los Angeles, CA — 9:00pm Monday

You knew it had to be this way — it wouldn't be much of a story otherwise. At the American ticket counter, I'm confirming my non-stop red-eye LAX to Miami and decide it might be nice to upgrade to First Class for such a long flight. The agent says, "that will be an extra $980." I retreat to a request for Business Class…

"That's $150 extra."

"I'll take it."

"Do you have your number?"

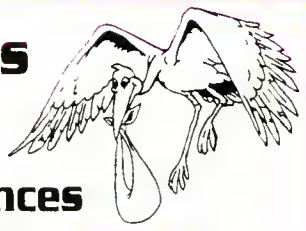
"What number?"

"You have to have a number to get this upgrade rate."

"I don't have a number. How can I get a number?"

"I can give you a number, just sign here."

BitBangers



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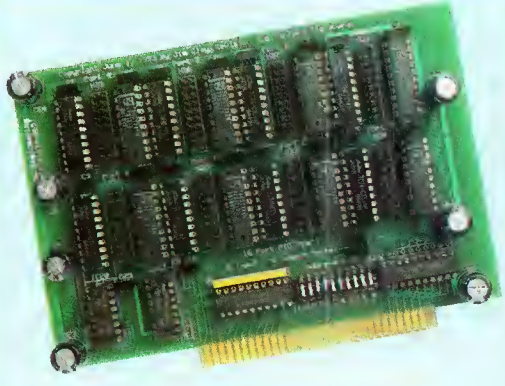

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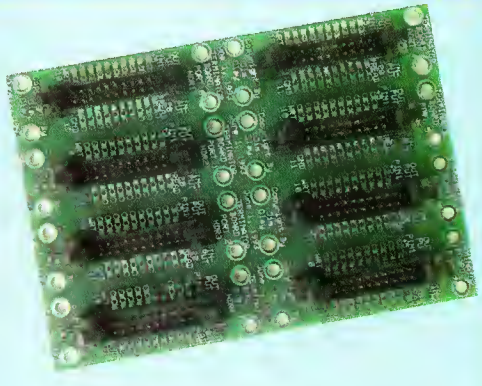

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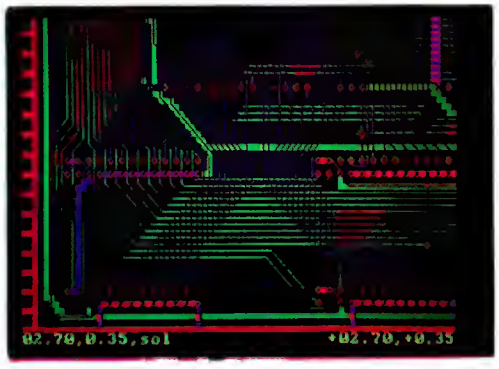

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Wild Ideas in Laser Printing!

Reader Service Number 73

Miami Money Races

"Ok, sign me up." Now, I'm a "Frequent Flier" on American Airlines. It doesn't matter that I have no accrued miles, at least I have my number. Don't you just love capitalism!

Los Angeles, CA — 10:00pm Monday

I'm aboard an American DC-10, snuggled in my wide, gray, supple leather Business Class seat, sipping my preflight champagne. I figure my $150 is covering nearly $20/hour rental on this comfy seat and, at one drink per hour, the drinks will amortize out to about $10 a pop with free prelanding coffee.

After take-off, I can't sleep. This is crazy. Maybe this whole thing is a scam. Maybe I really don't want this project anyway. I don't even know these people — why am I breaking my neck flying over 4,000 miles in the middle of the night when I could be sleeping at home letting FEDEX take its best shot at beating the bank wires?

I remember there's this scene in the movie *Iron Will* where the native American Indian tells the young Will Stoneman before the 500 mile dogsled race: ***"Run longer and sleep less. Each night of the race, sleep less and less. Then, on the final night when no one sleeps, the night will be your friend."***

I've been doing this for years. All-nighters are one of my specialties. If there really are those other buyers, can I really beat them? Will this actually make any difference? In a world full of people exercising free will, what difference does this sort of act make?

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Reader Service Number 118

Then the inflight movie starts. Wouldn't you know it, they're showing *The Paper* with Michael Keaton. I'm into my second scotch & soda during the second half of the movie with all those scenes of the newspaper presses running and the page layout and the darkroom and the replating and the presses revving up to full speed ... and I knew what I already knew: I wanted this thing real bad. I wanted this project; the whole plant would be nothing without this Web Press.

Miami, FL — 6:39am Tuesday

It's almost 90 degrees and raining heavily. Nothing could be more miserable, except maybe Boston in mid-January. This is definitely not high season in Miami. Off the plane and into the rental car.

Miami, FL — 7:30am Tuesday

I arrive at the broker's office at 7:30am with another check that supersedes the one FEDEX will deliver to the main office in Boston in a couple of hours. Jaws have dropped to the floor. They had no idea I was this serious. They want me to talk with Joe in Boston ...

"Joe, I've just given your man here a check that replaces the one you'll receive in a couple of hours."

Joe seems hesitant. Says something about the bank wires. (There must really be other buyers.)

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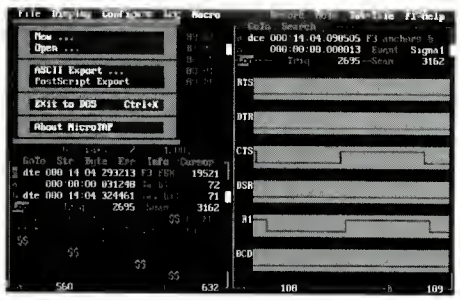

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Reader Service Number 24

"Joe, if you don't have a bank wire confirm in hand, I want that press. I'm buying what you are selling and I learned in *Contracts 101* that my check for the full amount secures the sale. Do we have a deal or have I wasted an evening at 35,000 feet?"

Joe gets defensive: "You will have to replace that check with a bank wire today."

"Ok, I'll have my bank wire the full amount to you in Boston by noon. That will replace the Miami check that replaced the Boston check." (It would have been comical, but I sensed that he had told the other buyer(s) that they had done the deal and now he was going to have to do some explaining.)

"Oh, all right. But, you'll have to load it and get it out of there in a week."

Now I knew there were other buyers.

"No, your deal was FOB. I supply the trucks, your boys load them."

I get off the phone and Joe goes back and forth with the Miami broker (probably something to do with commissions). They finally resolve that I am the buyer. Only then did we drive over to the warehouse to view my scrap metal.

Anytime that you buy something sight-unseen, you have to remember to gird yourself when you first get to see it. I've never done this but to have the initial feeling that I had bought a pig in a poke. You have to walk around eyeing it for some time, just accepting ownership/responsibility for it. Then, slowly, the mind begins to see beneath the surface.

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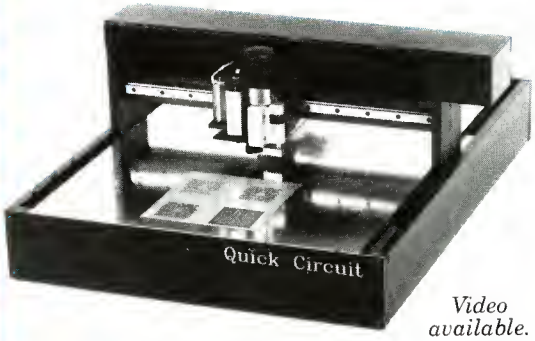

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Reader Service Number 103

Miami Money Races

I notice that everything appears to be there. ***Three of the four units have been rebuilt and still have fresh ink in the wells. The fourth unit is partially rebuilt and the remaining parts to finish it are in a crate nearby.*** This is incredible! Now, the mind begins to assimilate the purchase and instead of seeing flaws, begins to see the potential.

If it's in usable shape, why the big discount on the price? First of all, it is about 30 years old. Secondly, it's torn down and cannot be demonstrated. Thirdly, the fourth printing unit is in the middle of being rebuilt. Fourth, the system is a repossession and they didn't take any time when removing it to mark any of the wires in the harnesses or wiring conduits (there are dozens of cut wires hanging out of each piece of the system).

Finally, there are no manuals, instructions, or wiring diagrams of any kind! The ultimate jigsaw puzzle for the mechanical engineer. Remember the old Erector Set that was all parts and a little booklet with some pictures of the possible projects, but no detailed instructions. Ok, I admit it, this is going to be one fun toy for me.

I own it, so no since hanging around.

Miami, FL — 4:15pm Tuesday

Outbound on a Delta 727. It takes 15 - 20 minutes for the aircraft ventilation system to clear all the humidity from the cabin.

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"DiskDupe does everything you'd want a disk duplication utility to do... and does it FAST!"
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DiskDupe's new 4.0 duplicates, formats and compares disks **up to 6 times faster than Dos** with **no swapping**! Talks directly to the floppy controller for maximum speed. Cleans drives. Detects bad disks to ensure **perfect copies.** **Automatically senses disk type.** Stores disk images on hard disk. **Automatically formats** disks if needed. Detects malfunctioning drives. **Converts** 5.25" to 3.5". **Senses disk changes** without a keystroke. Supports EMS, XMS and mouse. Offers easy-to-use pulldown menus or complete command line control. **DiskDupe Pro** also **prints labels, serializes**, makes disk sets, customized disks, supports four drives and 2.8Mb drives.

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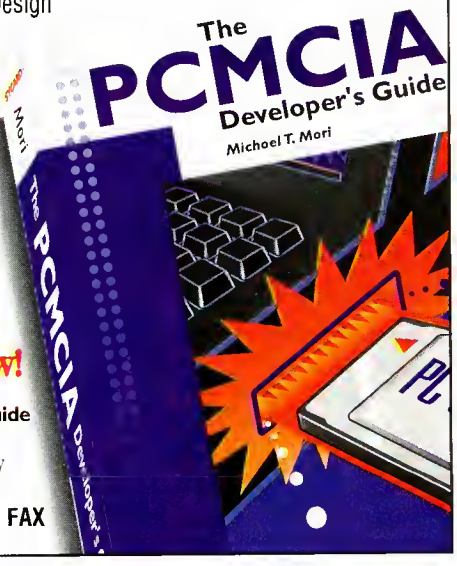
Reader Service Number 67

Hot Off the Press.

The PCMCIA Developer's Guide, a comprehensive design guide for PCMCIA hosts and cards. It will guide you through the maze of standards, ExCA™ (Quickswap™), and various vendor offerings. Save weeks of research time! If you are developing PCMCIA products, this book is for you.

- Host Adapter Design
- Card Design
- Software Requirements
- Socket and Card Services Reference
- Sample Host and Card Schematics
- Extensive Directory lists



Order now!
The PCMCIA Developer's Guide
$89.95 440 pages
Sycard Technology
(408)247-0730
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Reader Service Number 77

Dallas/Fort Worth, TX — 5:30pm Tuesday

Change planes to another Delta 727.

Colorado Springs, CO — 8:30pm Tuesday

Back to square one; Elapsed time: 26.5 hours, covering 6,000 miles using 5 planes on three different airlines.

Keep on Truckin'

Unlike *The Boston Operation*, this time I didn't have to tear the equipment apart and load it on the trucks. I was figuring all along that the teardown on a system like this would take me almost a month on site. That much time, transportation, housing, and meals would probably have cost me as much as I paid for the whole press (does this mean that I got the press for free?).

It took almost four truckloads to make the move over a period of about two weeks. This stuff is just plain heavy. Most pieces required two forklifts to unload off the trucks. All the trucks had drop-deck trailers which makes it possible to unload inside the building.

Probably the most interesting piece of equipment is the drying oven. Like a big box, 8' x 8' x 15', it has enough gas plumbing and air circulation/ventilation blowers to look like some kind of home-made atomic bomb. Without any manuals, this could be the most difficult piece to figure out. It has a 3" gas line into it and the scale of the temperature gauges on the side read from 100 degrees to 1000 degrees F — if all else fails, I guess I could open a bakery with this thing.

Installation Plan

Normally, the floor is prepared with large I-beams set in 12 - 18" of concrete. I'm not ready to spend $10,000 on such a floor, so I'm laying out two H-beams, 80 feet long, like a railroad track with half-inch steel plates under them just like railroad ties. Unlike a railroad track, these ties will be bolted to the existing concrete floor and plenty of cross bracing welded between the two H-beams. All the equipment then mounts on top of these H-beams, which are shimmed to be level for the full 80 feet.

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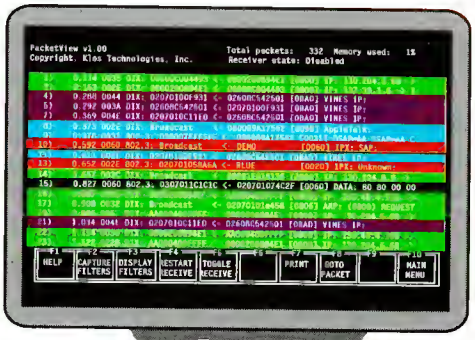
PacketView is the first truly low-cost network analysis and debugging tool available for the PC! Supporting Ethernet, Token-Ring, and ARCNET, PacketView can go places no other software-only analyzer can! PacketView is an essential tool when developing network drivers, protocol stacks, routers, and many other network based software products! And at only $299, how can you go wrong? Download the demo from our BBS at (603) 429-0032 and see for yourself just what PacketView can do for you!



Features:

- ☑ Protocols recognized: TCP/UDP/IP, SNMP, Banyan VINES, Novell IPX/SPX/ NCP/RIP/SAP, XNS and AppleTalk
- ☑ Use your own PC and Ethernet network adapter (in most cases)
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Reader Service Number 25

The Real Logic Analyzer

Test your Logic circuits with the printer port of your IBM or compatible computer!

- ☑ 5 Input capture channels via printer port
- ☑ High Speed 64K input capture buffer
- ☑ Glitch capture and display
- ☑ Full triggering on any input pattern
- ☑ Automatic time base calibration
- ☑ 4 cursors measure time and frequency
- ☑ Save, print or export waveforms (PCX)

The Real Logic Analyzer is a software package that converts an IBM or compatible computer into a fully functional logic analyzer. Up to 5 waveforms can be monitored through the standard PC parallel printer port. The user connects a circuit to the port by making a simple cable or by using our optional cable with universal test clips. The software can capture 64K samples of data at speeds of up to 1.2uS (Depending on computer). The waveforms are displayed graphically and can be viewed at several zoom levels. The triggering may be set to any combination of high, low or Don't Care values and allows for adjustable pre and post trigger viewing. An automatic calibration routine assures accurate time and frequency measurements using 4 independent cursors. A continuous display mode along with our high speed graphics drivers, provide for an "Oscilloscope-type" of real time display. An optional Buffer which plugs directly to the printer port is available for monitoring high voltage signals.

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Requires 286, or higher with EGA or VGA display.

LA20	Software Only	$79.95us
Software With Test Cable		$99.95us
BUFF05	Buffer	$39.95us

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Fax: (613)599-7089

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Reader Service Number 141

I guess I'm foolish enough to think I can figure this puzzle out and get it running for the Nov/Dec issue. Like most systems, though, it will do the job with perhaps only 2/3 of the system configured. The remaining 1/3 has to do with things like high speed paper splicing — allows the press to run non-stop.

The drying oven is a real concern. The ink used in a heat-set Web Press is meant to be fried, it won't dry fast enough without the oven. But, I've been wondering if I couldn't use ink meant for a Sheet-fed press — it air-dries very quickly.

I'm in a hurry to get this thing to print, not only so it will pay for itself, but also because my entire production process for this magazine will be completely integrated at that point. The dollar savings is one thing, but I think I can compress my production time by another 50%.That is priceless.

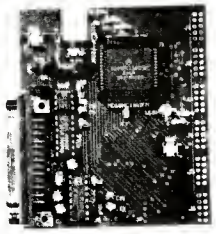
WEG

$79.95 68HC811
A1 Version - $59.95
Single Board Computer
SBC-E2
Develop Your Own Projects

Programs completely from PC via RS-232. 2048 Bytes EEPROM. 256 Bytes RAM. 24 - TTL I/O Bits. 8 - 8 bit A/D Inputs. SPI.

Relay Interface Board. RL-8 $39
8 Isolated SPST Relays. 5 Amp, 240 VAC. 3 "x 3.7". Use with SBC-E2 or any TTL Level Driver.

DTMF Decoder Plug In Module. DTMF-1 $19
Decodes, stores and downloads DTMF to PC. Turns the SBC-E2 into a complex DTMF controller. Perfect for a DTMF logging system.



SBC-E2 is low power CMOS, <20 ma, 5 volts DC. 3.1" x 3.6". FREE Bootloader, 480 pages of documentation, schematics, utilities, sample programs and source code included.

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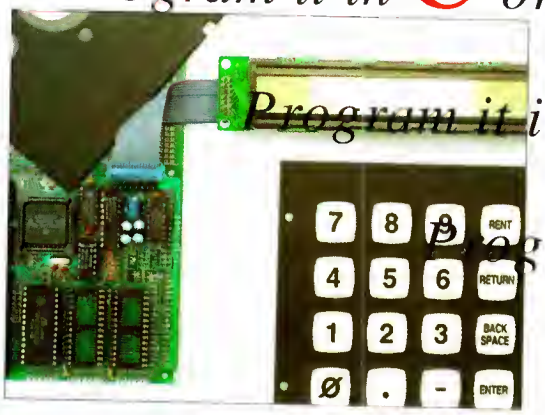
68HC11 Controller & Languages

Program it in **C** *or*



Program it in **Basic** *or*

Program it in **FORTH** *or*

Program it in **Assembly**

$99

Low Cost Development Package: Controller + Languages + Manuals on disk included!

Package Price Breakthrough!

The NMIT-0020 Single Board Computer is perfect for dedicated controller with convenient interfaces for LCD displays and keypad. Intelligent LCD's up to 2 lines by 80 characters and matrix keypads up to 4x5 can be used. The processor is the popular F68HC11 with many features, including SCI and SPI serial channels, 8-bit 8-ch. A/D, 20 available I/O lines, Watch Dog Timer, 1/2K EEPROM and Max-FORTH w/Floating Point Package embedded in 12K internal ROM. SBC expands F68HC11 providing 3 28-pin JEDEC sockets for 8-32K RAMs, ROMs, EPROMs, EEPROMs, etc. RS-232 conversion supplied. Requires external regulated supply: 5V at ~30 mA. Based on NMIX-0020 board, so many features may be added as desired by the user (or by factory - call for details & prices).

Languages supplied on accessory disk: Small C, Basic, and Assembler. FORTH resident on chip (may be disabled). Languages come with manuals on disk. Communications utility, MAXTALK included to allow PC clone to act as terminal for download and development. WIPE utility included allows internal ROM, EEPROM, WDT to be enabled/disabled, and EEPROM to be erased. Manuals on disk: UM-MAX Max-FORTH Users Manual, HM-20 NMIX-0020 Hardware Manual, Small C manuals with examples, BASIC11E9 Manual.

SBC and utility disk - $99. Keypad and LCD not included. Great value. Call today! New Micros, Inc. 214-339-2204

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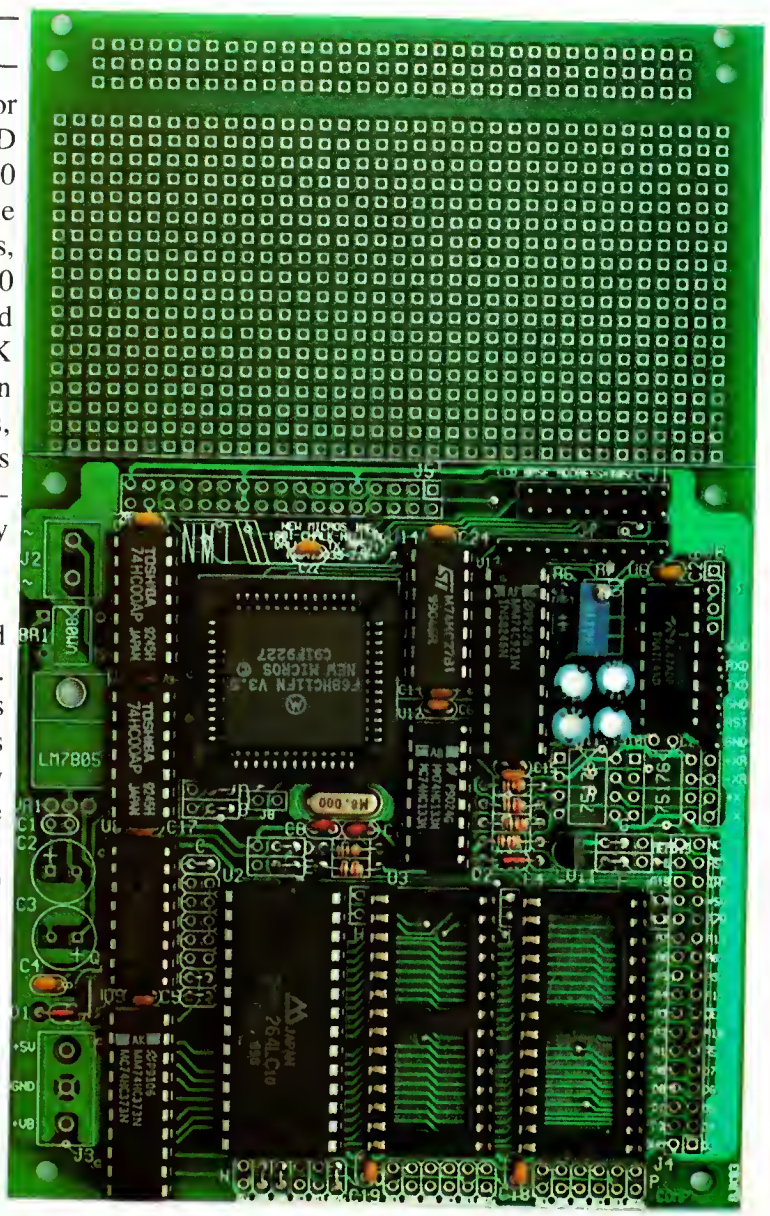
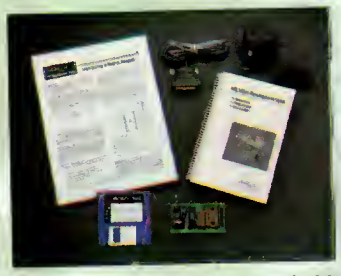


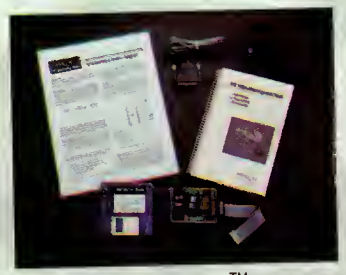
Reader Service Number 85

PIC®16Cxx MICROCONTROLLERS and TOOLS

In price and availability, nothing compares to PICs.



PIC16Cxx Programmer **$199**
Supports PIC16C5x, '71, & '84.
Also PIC16C64 with 40-pin adapter.



TrueFlight for '71/'84 ™ **$299**
Programmer & flash UV eraser form development system for '71 & '84.

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Downloader allows you to run PIC16C5x code in-circuit at 20 MHz.

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Provides 20-MHz debugging for PIC16Cxx devices ('64, '71, '84,...).

PICs are the answer to many small controller needs, especially if price is an issue. A typical PIC is the PIC16C54-RC/P; it's an 18-pin DIP package with 12 I/O lines, 512 words of PROM, and 32 bytes of RAM, all for around $4.00 in small quantities. And newer PICs have interrupts, A/D, and up to 33 I/O lines.

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If you'd like information on our PIC tools, or you'd like our complete catalog, please let us know. We'll be happy to send whatever materials you need.

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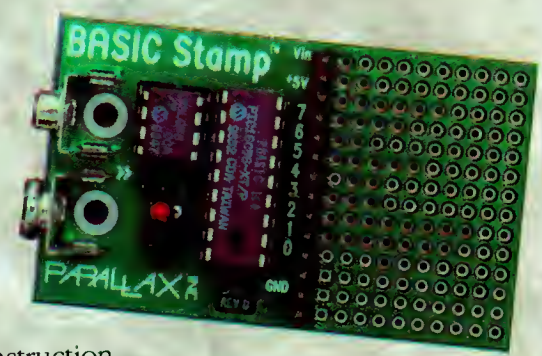
C compiler from Byte Craft supports PIC16Cxx and 17Cxx devices.

** Includes base unit price of $699, plus average PIC module price of $100.*

BASIC STAMP™

Stamp-Sized Computer Runs BASIC



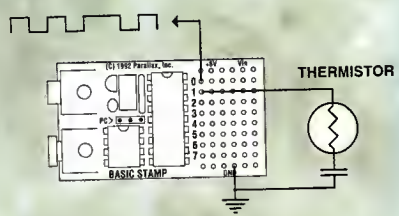
The BASIC Stamp is a small single-board computer that runs BASIC programs. It has 8 I/O lines, which can be used for a variety of digital and analog purposes. The Stamp's BASIC language includes familiar instructions, such as GOTO, FOR...NEXT, and IF...THEN, as well as SBC instructions, such as SERIN, PWM, and BUTTON. Each instruction takes 2-3 bytes of the Stamp's 256-byte EEPROM, resulting in a maximum program size of 80-100 instructions. Programs execute at about 2,000 instructions per second.

The BASIC Stamp Programming Package contains everything you need to program Stamps using your PC. The package includes our editor software, programming cable, manual, application notes, and free technical support. **The package is available for $99; Stamps are sold separately for $39.**

NEW

New Stamp Module Available Soon

A number of customers have expressed interest in a SIP-type Stamp for use in their products. So, we designed the "BS1-IC" depicted above (actual size). The BS1-IC has the same functions as the original Stamp, but without the prototype area and battery clips. We should have production units in November, depending upon availability of surface-mount parts. **Pricing will start at $29.**



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Here, the Stamp uses the POT instruction to read a thermistor. The reading is linearized and then sent out serially.

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